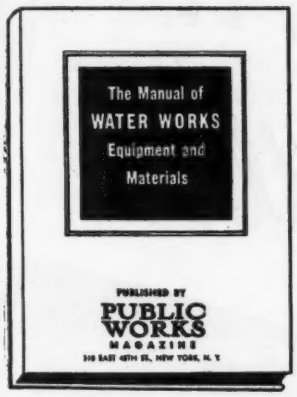
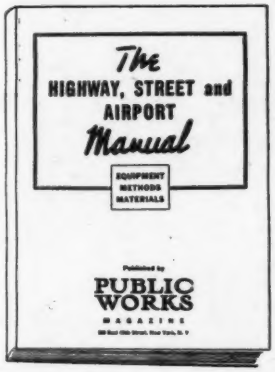
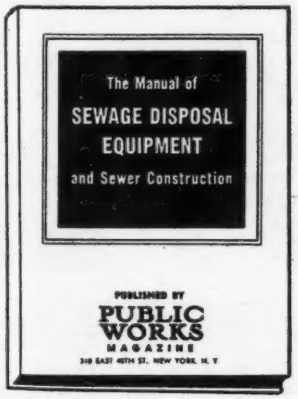
Year 'Round EXHIBITS for POST-WAR PLANNERS







These handy Manuals describe and illustrate every type of product suitable for use in Water Works, Sewage Disposal, Highways, Streets and Airports. They are indispensable to the engineer who wants to include the latest and *most efficient* equipment in his plans.

If you don't have copies on your desk write today for information on how to obtain those you need.

PUBLIC WORKS Magazine
310 East 45th St. New York 17, N. Y.

PUBLIC WORKS

Founded in 1896

Devoted to the interests of the engineers and technical officials of cities, counties and states

Vol. 75 No. 12

A. PRESCOTT FOLWELL, Editor

DECEMBER CONTENTS

HIGHWAYS AND AIRPORTS

Price Trends in Highway Construction ... 16
Soil Movements As Affecting Paved Surfaces ... 17
Non-Skidding a Pavement in Rye, N. Y. *By Raymond W. Murphy* ... 20
Cement-Grouted Pavement ... 26
Treatment of Icy Pavements ... 28
Use of Vinsol Resin in Air-Entraining Cements ... 40
Airports for Heavy Planes Needed ... 43
Tests of Traffic Paints ... 47
May a Municipality Lease Unopened Streets? ... 48
A City-wide Street Tree Plan ... 49
Financing Cleveland's Airport ... 49

SEWERAGE AND SANITATION

Constructing Pasadena's Outfall Sewer. *By J. H. Allin* ... 14
Charges to Industries for Treating Their Waste in a Municipal Plant *By Paul A. Uhlmann* ... 23
Sewage Treatment Problems Require Thorough Investigations. *By William S. Lozier* ... 26
Capacities of Sewage Gas Meters ... 46
Gas Explosion in Disposal Plant ... 46
State Aid on Sewage Disposal Plans ... 48
The Sewerage Digest ... 54

WATER SUPPLY AND PURIFICATION

Controlling Distribution System Pressures by Means of Valve Control. *By J. M. Lloyd* ... 13
Reworking a Diesel Engine. *By Ernest E. Didier* ... 19
Diatomaceous Earth Filters for Water Purification ... 21
How Henderson Maintained an Adequate Water Supply. *By Henry T. Powell* ... 34
Water Distributing System a Public Utility ... 43
The Waterworks Digest ... 50

WAR AND POSTWAR EMERGENCIES ... 7

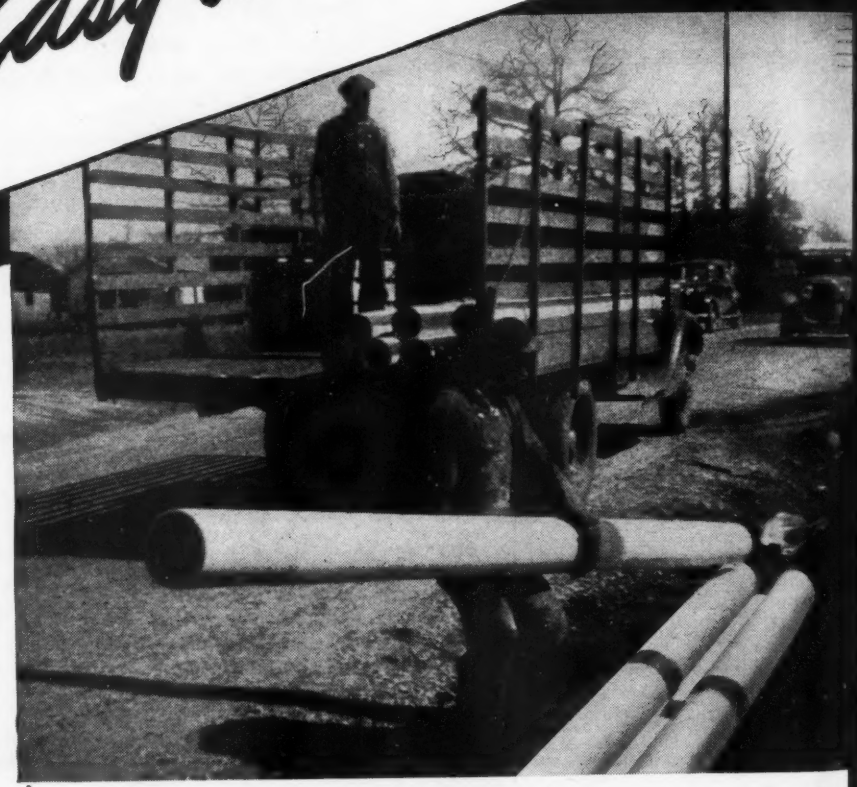
GENERAL

The Wabash River Flood at Vincennes. *By A. F. Reinke* ... 11
Preparation of Graphs ... 20
Five-Year Engineering Courses at Cornell ... 44
Keeping Up With New Equipment ... 58
Reader's Service Department ... 67

Published monthly by PUBLIC WORKS JOURNAL CORPORATION
Editorial and advertising offices: 310 East 45th St., New York 17, N. Y.

J. T. MORRIS, *President*; CROXTON MORRIS, *Treasurer*; A. PRESCOTT FOLWELL, *Secretary*. *Advertising representatives:* New York: ARTHUR K. AKERS, *Advertising Manager*; Chicago: LEWIS C. MORRIS, 612 No. Michigan Ave., Chicago 11, Ill.; Cleveland: ALONZO HAWLEY, 326 Bulkley Building, Cleveland 15, Ohio. SUBSCRIPTION RATES: U.S.A. and Possessions, Mexico and Cuba, $3.00; Canada, $3.50. All other countries, $4.00. Single Copies, 35 cents each except issues containing book-length texts, which are $1.00 apiece.

These advantages make TRANSITE PIPE *Easy to handle!*



MORE FOOTAGE can be carried per truck load because Johns-Manville Transite Pipe is light in weight...fewer men are needed for handling...and mechanical equipment is not needed except for the larger sizes.

Besides, this asbestos cement pipe cuts installation costs in other ways, too. Its Simplex Coupling makes possible tight, flexible joints, and fast, easy assembly. And, Transite Pipe may be cut on the job with an ordinary saw.

Another outstanding feature of this pipe is that it is non-metallic and, therefore, its high flow rate can never be choked off by tuberculation. Transite's high corrosion-resistance contributes to its low maintenance cost.

Get the full story about Transite Pipe's many advantages. Write for Transite Pressure Pipe Brochure TR-11A, Johns-Manville, 22 E. 40th Street, New York 16, N. Y.

Plan now to improve and expand your water and sewerage systems after the war. For a copy of "Blueprint Now!", write the Committee on Water and Sewage Works Development, Suite 2110, 500 Fifth Ave., New York 18, N. Y.

APPROXIMATE WEIGHTS OF TRANSITE PRESSURE PIPE

Pipe Wt. Lb. Per Lin. Ft. Including Coupling and Rubber Rings	Pipe Size (I.D.) →	3"	3½"	4"	4½"	5"	6"	7"	8"	10
	Class 50	3.9	4.6	5.2	6.0	6.8	8.3	10.1	12.6	16
	Class 100	4.2	4.8	5.5	6.2	7.0	8.5	10.6	12.8	21
	Class 150	5.0	5.9	6.7	8.0	9.4	11.6	15.2	18.0	29
	Class 200	7.3	8.3	9.3	10.9	12.8	16.6	20.9	25.2	39

Pipe Wt. Lb. Per Lin. Ft. Including Coupling and Rubber Rings	Pipe Size (I.D.) →	12"	14"	16"	18"	20"	24"	30"	36
	Class 50	21.3	26.8	33.0	38.6	45.6	60.1	96.2	136
	Class 100	29.4	39.3	50.4	62.5	76.4	107.5	164.2	230
	Class 150	41.1	55.5	69.8	87.2	106.8	152.1	241.7	346
	Class 200	52.7	71.7	93.8	119.6	149.2	213.3	333.0	466

*Class designation represents maximum working pressure.

JOHNS MANVILLE JM PRODUCTS

Johns-Manville TRANSITE PIPE

An asbestos product for efficient, economical water and sewer lines

WAR and POSTWAR EMERGENCIES

Highway Laws for Postwar Traffic

One of the war emergencies was occasioned by the large amount of interstate trucking demanded by the needs of war plants scattered throughout every state of the Union. Recognizing this, the American Association of State Highway Officials adopted, as desirable, standards for maximum width of vehicles—96", height—12½ ft., length—45 ft. for combined tractor and trailer, and weight—18,000 lb. on one axle, 30,000 lb. on two axles, 40,000 lb. on three axles or any combination vehicle. The laws of nine states had set limits lower than these, but the governments of those states agreed to waive their legal limits for the duration of the war. Those states were Alabama, Arkansas, Florida, Georgia, Illinois, Iowa, Kentucky, Nebraska and Tennessee.

This (perhaps illegal) consent of state officials to overlook infractions of the traffic laws of their states was for the duration only. It has undoubtedly aided in the prosecution of the war. But what about the peace emergency and the public works which we hope to, which we must, prosecute to absorb suddenly idle men and plants? Will Illinois, Kentucky, Tennessee and Alabama, forming a continuous wall from the Great Lakes to the Gulf, prevent interchange of freight between the Atlantic Coast States and those west of the Missouri in trucks which do not conform to their lower standards? The tendency in war work has been to make larger and heavier trucks and planes, and these states may find it difficult to compel even their own citizens to conform to prewar standards; and interstate trucking concerns, after these years of freedom from restraint, are not going to do so without making trouble.

What has been the result on the pavements in those nine states of this exceeding of previously enforced limits? If it has not caused increased wear, why not let it continue? If it has, and the other 39 states have roads and bridges that can carry such loads safely, shall these nine remain in the "horse and buggy age" or will they adopt, as part of their postwar work, the strengthening and adjustment of their highways, if necessary (we question whether much of it will be), to meet the standards which 80% of the states consider reasonable?

If the old standards are not to be enforced, then the state laws should be changed accordingly. And this change should be made at the first meetings of the respective state legislatures, most of which occur next month.

Public Works in Hawaii

We wonder whether Hawaii is expecting to go into public works on a grand scale, or what. The November issue of the "News Letter" of the American Public Works Ass'n gives a list of 28 new members of that society, and of these, Hawaii is the home of 19, from A. Y. Akinaka, contractor and engineer, to E. L. Wung, Chief Engineer, Dept. of Public Works.

The Federal Aid Highway Bill

We had hoped to be able to tell in this issue the terms of the Federal aid highway bill passed by Congress; but at the time of going to press there is no such bill. However, on Nov. 29 the House passed H. 4915 authorizing $500,000,000 annually, $225,000,000 for regular Federal aid roads, $150,000,000 for secondary and feeder roads (each of these exceeds the Senate item by $25,000,000), and $125,000,000 for urban highways. Included is a provision that prohibits "advancement of funds for expediting work undertaken in states that divert to non-highway purposes automotive taxes levied for road use." Provision for constructing flight strips along highways, contained in the Senate bill, was omitted. The two bills are now in the hands of a conference committee.

Sixteen States Prohibit Motor Tax Diversion

Maine in September and Washington in November joined the states which, by Constitutional amendment, prohibit the use of automotive taxes for anything but road purposes. This brings the total to 16. In addition, Arizona, Arkansas, Connecticut, Mississippi and Wyoming made no diversion for non-highway purposes in 1943. As stated elsewhere, the recently passed House bill for highway appropriations contains a provision withholding such appropriation from any state which diverts such funds.

A Billion for Airports

The Civil Aeronautics Administration has recommended to Congress that it appropriate a billion dollars for a postwar program for building 3,050 new airports and improving 1,625 existing ones. The program involves five classes of airports, as follows: Class 1, designed primarily for private flying; Class 2, suitable for feeder airlines and private flying; Class 3, suitable for present-day twin-engine planes; Class 4, suitable for four-engine and other large planes, and Class 5, designed for long-range domestic and foreign operations.

Federal Loans for Planning Postwar Projects

Under the recently enacted "War Mobilization and Reconversion Act," Title V, the Federal Works Administrator is authorized to advance to states and their political subdivisions, "from funds appropriated for that purpose" (no funds have yet been appropriated), aid in financing the cost of architectural, engineering, and economic investigations, plans and other action preliminary to the construction of public works, not including housing. Funds that may be appropriated are to be apportioned among the states, 90% in proportion to population and 10% according to the Administrator's discretion; but the allotments to any state must be at least 0.5% of the total appropriation, and all projects must be "approved by competent local or regional authority."

LAYING CAST IRON BELL & SPIGOT MAINS

IN ANY TEMPERATURE RANGE, INCLUDING SUB-ZERO

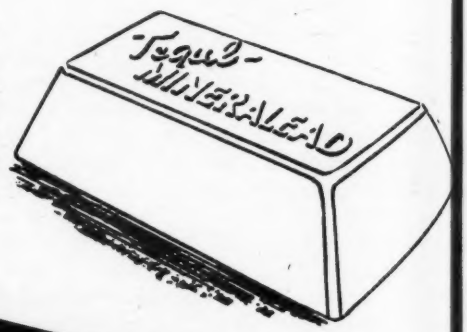
THIS *DIFFERENT* JOINTING COMPOUND WILL SPEED THE JOB!

TEMPERATURES from Zero to −36° are all in the day's work for *Tegul*-MINERALEAD. It handles, melts and pours easily, regardless of the thermometer's ups and downs. Snow, and floods that come with sudden thaws, won't harm *Tegul*-MINERALEAD stored unprotected on the job. The ingot form makes it immune to wetting, even when submerged.

Your workmen will find it easy to ship, store and work with. They'll appreciate its freedom from physical separation which sometimes spoils jointing compound in other forms. For no amount of jolting in transit from factory to job can change the correct composition of *Tegul*-MINERALEAD.

Tegul-MINERALEAD is *uniform, three times more elastic* than any other sulphur base compound, has *twice the resistance to mechanical shock* and is *twenty times more resistant to thermal shock*—sudden temperature changes.

By every consideration of facility in use and long range economy in laying and maintenance, you should look into *Tegul*-MINERALEAD for that next Bell & Spigot Water Line job. For informative literature, write our head office here at Mertztown. You can reach an ATLAS field representative at the nearest branch office listed below.



Tegul-MINERALEAD comes in ten pound ingots, easy to handle and economical on shipping and storage space. This form insures correct composition being maintained from our plant to your job. The ingot is readily broken with hammer and fresh supplies may be added to the melting pot without stalling the work. With *Tegul*-MINERALEAD you need no skilled labor, caulking or deep bell holes.

THE ATLAS MINERAL PRODUCTS COMPANY
of Mertztown, Penna.
Pennsylvania

*ATLANTA 3, Ga., 610 Red Rock Bldg.
*CHICAGO 1, Ill., 333 No. Michigan Ave.
*DALLAS 5, Tex., 3921 Purdue St.
*DETROIT 2, Mich., 2970 W. Grand Blvd.
*JACKSONVILLE 5, Fla., 1463 Talbot Ave.
*KANSAS CITY 2, Kan., 1913 Tauromee Ave.
NEW YORK 16, N. Y. 280 Madison Ave.
PITTSBURGH 10, Pa., 4656 Old Boston Rd.
TORONTO, Ont., McRae Engineering Equipment, Ltd. 11 King St., West

THE ATLAS MINERAL PRODUCTS COMPANY of California
REDWOOD CITY, California
*DENVER 2, Col. 1921 Blake St.
*HONOLULU 2, Hawaii, U. S. A.
SALT LAKE CITY 11, Utah, 1212 So. State St.
*LOS ANGELES 12, Cal., 817 Yale St.
*SEATTLE 14, Wash., H. D. Fowler Company P. O. Box 3084
*Stocks carried at these points

Tegul-MINERALEAD

PUBLIC WORKS Magazine . . . December, 1944

Vol. 75. No. 12

Vincennes during the flood of 1943.

The Wabash River Flood at Vincennes

How the city was saved by foresight of the U. S. Engineers and strenuous work of the city officials and departments, with the indispensable aid of army troops and government engineers.

By A. F. REINKE
City Engineer, Vincennes, Indiana

THERE have been floods in the Wabash river since white men first settled along its banks, but the flood of May, 1943, was a record breaker for the height of the flood stage. By the grace of God and the help of the troops from nearby army commands, Vincennes was one of the few cities in the entire Wabash Valley which escaped serious damage from the flood.

A. F. Reinke

When the George Rogers Clark Memorial was built at the south end of the city's river front, a concrete seawall was constructed along the river, extending north from the memorial until it met the embankment which carries the B&O Railroad's switch track, which is high enough to form a levee and comes down to ground level at Harrison Park, a few hundred feet from the river. The top of this wall was high enough to stand a 27 foot flood stage. In 1934, one of the W.P.A. projects in Vincennes was the building of a continuation of this seawall from the railroad embankment north for a fraction over a mile along the river to Niblack Drive, and for a short distance parallel to Niblack Drive until it reached the point where the pavement of the drive was the same height as the top of the wall.

From the Clark Memorial south along the Wabash river for a distance of 20 miles the Federal government had constructed the Breevort Levee, with an elevation to withstand a 29 ft. flood stage.

The above constituted the city's flood protection, which everyone thought was adequate to take care of any threatened flood. On May 12, 1943, John H. Kurrasch, an engineer with the U. S. Engineers, came to Vincennes and opened an emergency flood office. He reported that, from the rainfall and run-off data gathered by his department, a 27-foot crest was predicted for Vincennes within a few days. The head of the State Weather Bureau had predicted a crest of 25 ft., and in previous years his predictions had been correct and no one in Vincennes

Coast Guard boat on rescue work.

felt any alarm over the situation. But conditions in the northern part of the state grew worse and it soon became apparent that the government's prediction was the correct one. On the morning of Wednesday, May 19, the mayor met with the Board of Public Works and Safety and several of the city council members and they decided to ask for help from the U. S. Engineers. Mr. Kurrasch presented the request to the headquarters at Louisville, which granted the request and placed Mr. Kurrasch in charge of the government men and equipment.

Mr. Kurrasch immediately put in calls for army troops and government engineers to help supervise the work. It was decided to place mud boxes on top of the seawall to raise it to 29 feet elevation (see sketch), and make a two-foot sandbag levee along Niblack Drive to raise it to the same elevation. The Office of Civilian Defense, which was already organized for blackouts, was asked to furnish all the civilian help that was needed. Police Chief Montgomery was placed in charge of the civilian workers along the wall. As City Engineer, I was to secure and supply all the equipment necessary to keep the work progressing smoothly.

The city's employees of the street and park departments were put to work immediately. We secured steel I-beams from the Vincennes Steel Corporation and placed them in several large openings in the wall at the intersection of Oliphant Drive and Niblack Drive and at Kimmell Park. Sandbags, of which the city had 30,000 on hand, were used to fill in behind these beams. There are several large sand and gravel pits in Vincennes and there was no question of securing enough sand but the problem was getting enough trucks to haul it. The city had three dump trucks, the Knox County Highway Dept. had some, and the Indiana State Highway Dept. furnished as many as could be spared from their work. Additional trucks were secured from local haulers and later George Field furnished a number of army trucks. In all we had about forty trucks.

Meanwhile, I had contacted all the lumber yards in the city, and was able to secure all the 2″ x 4″ and siding necessary to build the mudboxes, to be delivered along the seawall where needed, and all the nails and wire needed for the construction of the boxes.

The top soil to fill the mud boxes we obtained from a pit just south of the city, belonging to the County Highway Department, which had two small shovels there.

By Wednesday night George Field had sent a detachment of 165 men who, together with civilian volunteers, worked all Wednesday night filling and placing sandbags in the 2 ft. high levee along Niblack Drive. Meanwhile, several of the government engineers and carpenters arrived and started making a sample section of the mud box in order to show the troops what was required when they arrived to begin work.

Just before midnight, Major R. T. Dodge, 308 Engineer Battalion, Camp Atterbury, arrived. He reported Company A and C of his battalion, consisting of 15 officers and 350 men, were on their way to Vincennes and arranged with Mr. Kurrasch the work that these men were to do.

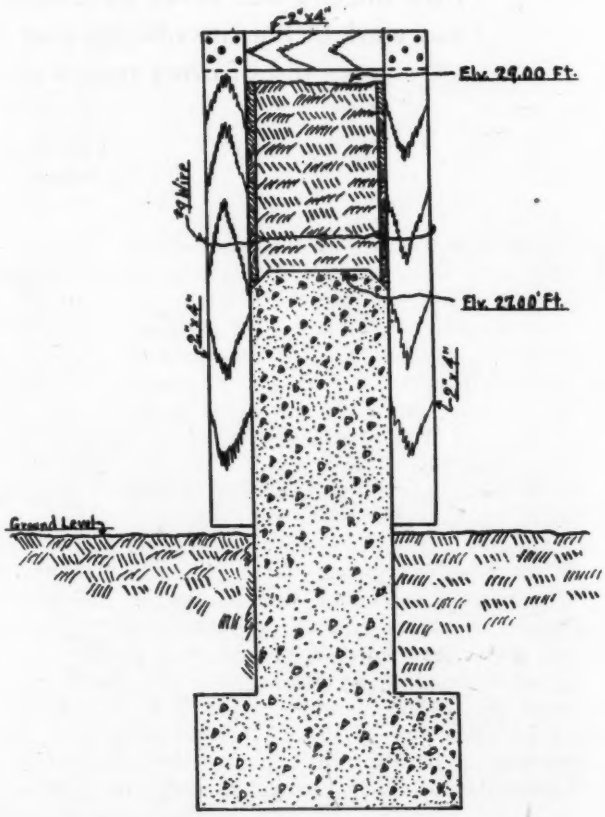
These troops, which had just returned to Camp Atterbury from two weeks' field maneuvers, were loaded on trucks and arrived in Vincennes at 3 A.M. Thursday morning and were quartered in the Gibault High School. They reported for work at 6 A.M. and under the supervision of the government engineers began constructing the mud boxes, filling them with soil and filling in the openings in the wall with sandbags. They also completed the sandbag levee along Niblack Drive.

Meantime the street department men together with civilian volunteers were building sandbag walls at sewer openings where the water was liable to back up into the streets. The river was beginning to rise rapidly at this time, and it was evident that the work would have to go ahead at top speed in order to get finished in time.

At 10 P.M. Thursday night 4 officers and 102 men from Fort Benjamin Harrison arrived and were immediately sent to help the troops and men already working. About this time calls were coming from the wall that the dirt was not coming in as quickly as needed. I went out to the gravel pit and found that the trucks could not get loaded fast enough, there being a number waiting at each shovel. I contacted a firm of local contractors who had a gravel pit near the city limits and a large shovel there, and transferred enough trucks to this pit to keep them all moving.

At 12 o'clock midnight, the last section of the mud boxes was put in place, but about 200 feet of them had not been filled in with dirt. This was in a low spot and water had seeped in underneath the wall through a pipe in the plant. This water, which was nearly waist

(Continued on page 45)



Method of placing mud boxes on top of the sea wall.

Controlling Distribution System Pressures by Means of Valve Control

When pressures fall in a high district during peak consumption, this district is valved off and the pressure in it raised by a booster pump.

By J. M. LLOYD
Water Superintendent, Tyler, Texas

THERE are various methods of maintaining high pressures during peak consumption periods, especially if a city is blessed with having sufficient storage and reservoir capacity as well as a sufficient water supply. But even then, there are periods when distribution mains which serve areas of high-rate consumption do not provide adequate pressures. Low pressures in our particular city used to occur during the hours between 5:00 p.m. and 10 p.m., especially through the high-class residential areas, which, as in most towns, are found on the highest elevations in the city.

Engineers, in designing a water distribution system to serve these high residential sections, usually consider only the domestic rate of use and provision for adequate fire protection. But since most of the larger homes were built, there have been increased demands upon the water distribution mains, such as the addition of large sprinkling systems, small swimming pools, and air conditioning units, and the additional consumption caused by these factors generally tends to lower the pressures in a water distribution system during the peak consumption periods. This problem is solved in some cases by providing a large feeder line to offset the increased demands imposed on the distribution system. This article deals with one way in which to maintain satisfactory pressures during the peak consumption months, without having to duplicate or lay larger size mains from a designated storage location to the areas in question.

The accompanying diagram shows how this may be done without causing too great an expense to a water department, which generally does not have sufficient funds for laying new mains to meet the pressure requirements of areas served by a 750,000-gallon standpipe. The elevation of water in the standpipe in this case is 614.5 when empty and 668.5 when full. During an average consumption period, all valves in the areas shown are open and an adequate pressure is maintained throughout the portion of the distribution shown. To the left of the diagram (indicated by the arrows) as well as to the upper part of the diagram,

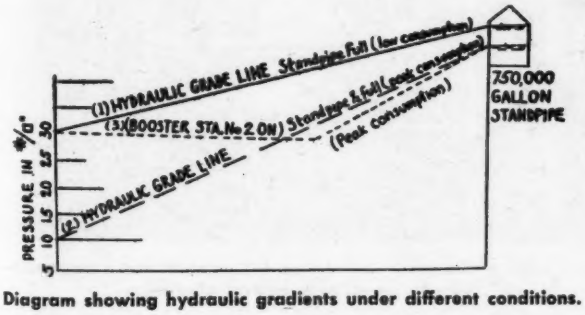
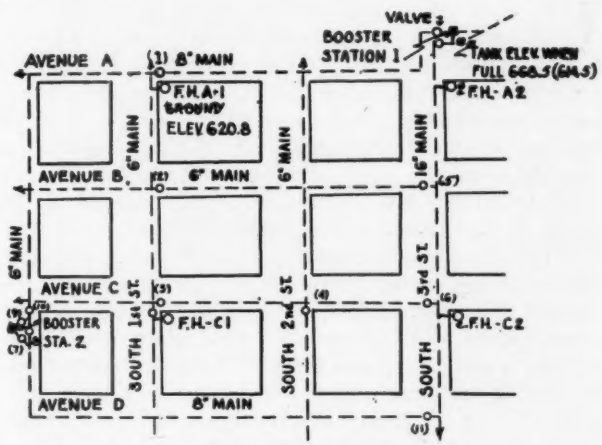

(1) HYDRAULIC GRADE LINE Standpipe Full (low consumption)
(3) (BOOSTER STA. No 2 ON) Standpipe ½ Full (peak consumption)
(Peak Consumption)
(2) HYDRAULIC GRADE LINE
750,000 GALLON STANDPIPE
PRESSURE IN #/□"
5 10 15 20 25 30

Diagram showing hydraulic gradients under different conditions.



Map of district affected.

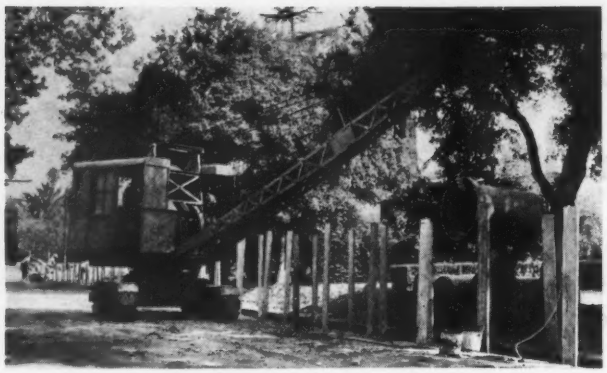
there are lower areas not shown which are served by the mains serving this area. However, the problem in question being controlling the pressures during high consumption periods, note as follows:

The area along Avenue A is served by booster pumps adjacent to the standpipe, of sufficient capacity to maintain a pressure of 40 pounds per square inch, even when the standpipe is half full, by closing down valve No. 5 on Avenue B and South Third Street, valve No. 6 on Avenue C and South Third Street, and valve No. 11 on Avenue D and South Third Street.

When the consumption reaches a point where the booster pumps located adjacent to the standpipe are not sufficient to give adequate pressure, then valve No. 11 is opened; valve No. 8, shown at booster station No. 2, is closed, and valves No. 7, No. 9 and No. 10 are open. By pumping around the valve No. 8, it can readily be seen that the pressure can be controlled in the area in question by means of pressure switches designed to kick on if pressure drops below 50 pounds per square inch. The system outlined above operates automatically, and during off-peak consumption periods does not operate. It requires only a short time to go out and open valves No. 5, No. 6 and No. 8; and the saving on the electrical power bill more than justifies the turning off and turning on of these valves.

During this period none of the valves is entirely closed, but they are shut tight and then opened a turn and a half to allow circulation. The pressure is adjusted to that desired by the control switches operated from the pressures at the various fire hydrant locations, such as FH-A-1 and FH-C-1, etc.

(Continued on page 20)



Lowering pipe into trench.

Constructin sa

By J. H. ALLIN

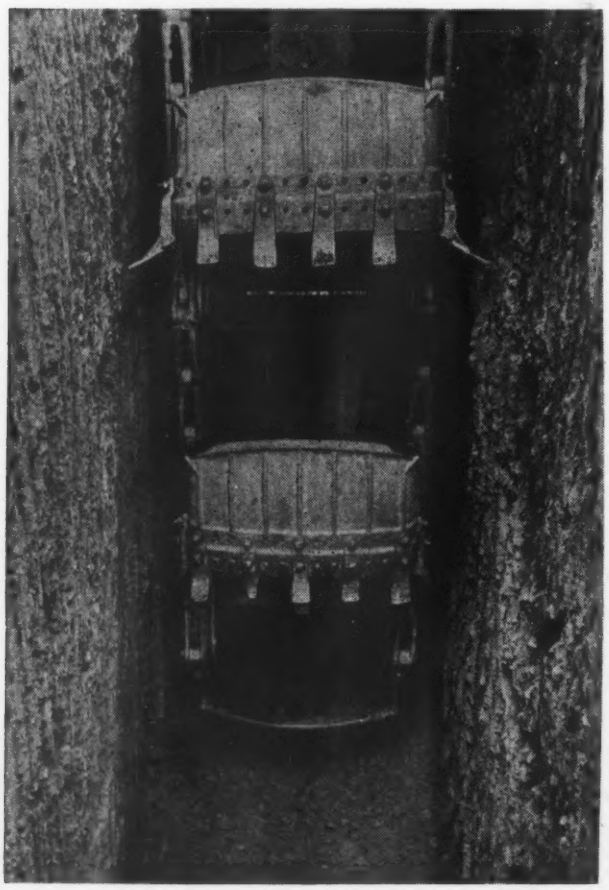
City Engineer and Supt. of Streets, Pasadena, Calif.

THE City of Pasadena, California, in 1927 constructed what is known as the West Side Outfall Sewer, terminating at the City of South Pasadena's sewer system. The sewer to which this was connected has far less capacity than the outfall which discharges into it; but for some time following this construction very little trouble was experienced due to this lack of capacity, as the flow through the outfall was normally quite small. With the development of the contributing territory, the flow increased to the point of overtaxing the local sewers and at times of heavy rains was increased due to infiltration, causing raw sewage to flow from manholes in the low areas and, mixed with storm waters, to spread widely through a residential section, causing a very unsanitary condition.

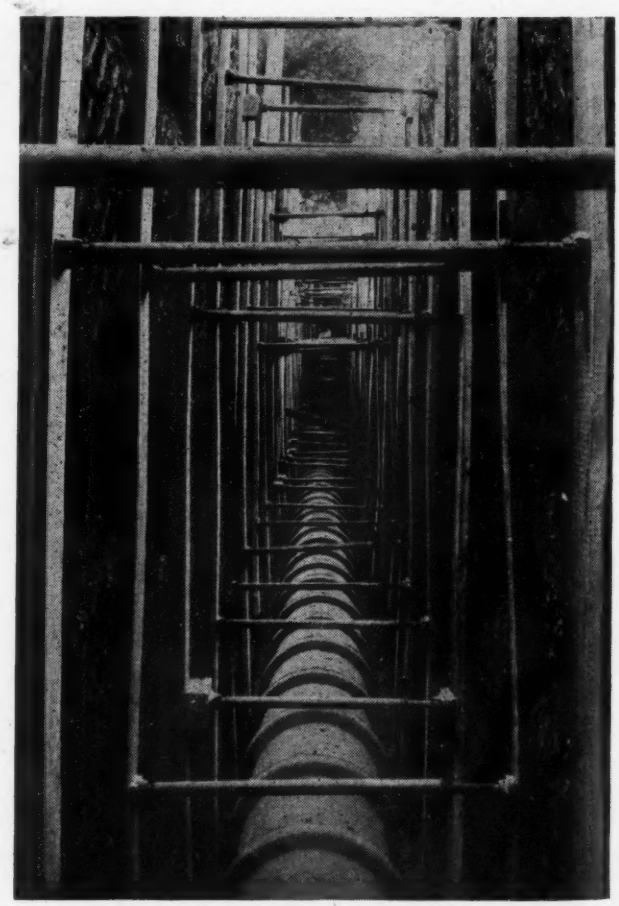
The urgent necessity of remedying this was recognized by the War Production Board, and the City of Pasadena was granted an AA-3 rating on all critical materials needed for extending the existing outfall sewer 7,336 feet along streets in the City of South Pasadena.

Design. The outfall sewer was designed by M. J. Wesseler, sanitary engineer for the Engineering Department of Pasadena, to carry a maximum flow of 18 cu. ft. per sec., using Kutter's formula with $N = 0.13$. The design called for 21, 24 and 27-inch vitrified sewer pipe, to be laid at grades ranging from .327 percent minimum to 2.554 percent maximum, and in trench depths ranging from a 7 foot minimum to a 28 foot maximum. In calculating the capacity requirement, the territory tributary to this sewer was considered to be fully developed as a residential district.

The construction necessitated passing under interurban electric and steam railroad tracks at four loca-



Looking down on the excavator buckets in a main trench 4 ft. wide.



The depth of the trench varied from 7 ft. to 28 ft. and it was necessary to use a large amount of shoring.

Pasadena's Outfall Sewer

An outfall sewer extension to relieve unsanitary overflow conditions from an existing structure, recently completed for the City of Pasadena, California.

Showing method of breaking or cutting 6-in. asphalt pavement in advance of the trencher, which is shown in the background.

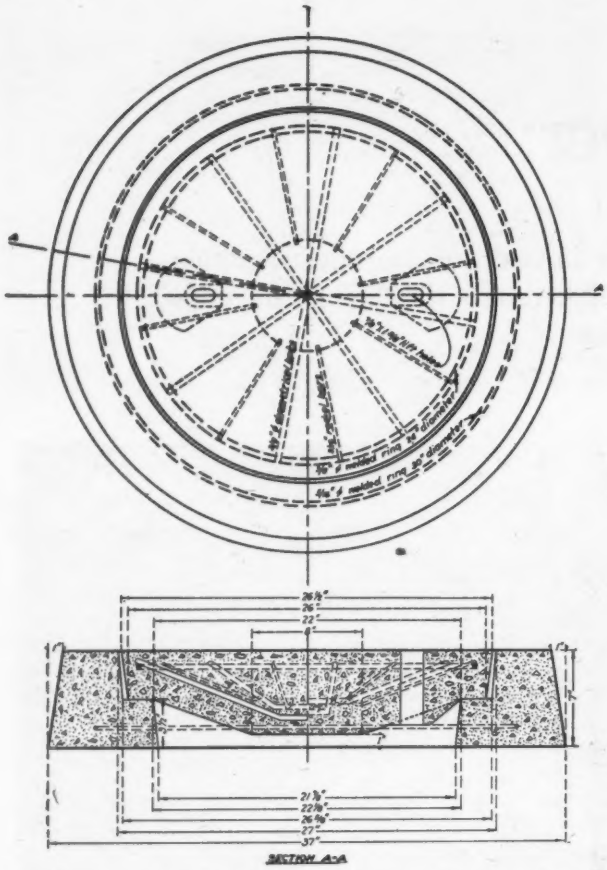
tions. A backfill of concrete mix, of 1:3:5 proportioning, was required at these locations to a height of 5 inches above the outside diameter of the pipe. Cradling to springline of 1:3:5 concrete was also required for a distance of 636 feet, where the cover over the pipe exceeded 20 feet. Pipe loadings were calculated on the basis of a firm sidewall excavation up to the springline of the pipe, and a weight of backfill of 130 lbs. per cu. ft., with a safety factor of 1½.

Manholes were spaced at intervals of not exceeding 280 feet. Reinforced concrete manhole covers and frames were used in place of the usual cast-iron cover and frame in order to conserve critical materials. These were designed for traffic loading and were manufactured by the Art Concrete Works of Pasadena. The unsupported area of the covers is 380.1 sq. in. Laboratory tests showed the covers to fail at loads of from 430 to 478 lb. per sq. in.

The contract for the construction of the sewer was made with the M. C. Nottingham Construction Company, for $51,726.83. Charles T. Schultz, construction engineer, was in charge for the City of Pasadena.

Trenching. Several hundred feet of uncharted water and gas mains, laid approximately 3 feet deep, were encountered in the line of the sewer trench. These were removed for salvage and the trench backfilled and leveled off to obtain an even roadbed for the large trenching machine.

The contractor was required to arrange with the Southern California Gas Company to cut out a section of all gas services in advance of the excavator and to replace them as soon as he had passed. He was also required to uncover all sewer laterals to the nearest joint on each side of the trench after passage of the excavator. These sewer lateral sections, which were of 4-inch cast iron pipe or 6-inch tile pipe, were replaced under separate contract between the City of Pasadena and the South Pasadena Plumbing Company at $1.50 per lineal foot for the 4-inch and $2.86 per lineal foot for the 6-inch. The average length of these sections was 7½ feet. The water services, some of which were of galvanized iron and others of copper, were cut and repaired by the regular repair crew of the Water Department of the City of Pasadena. The



Special concrete manhole cover and frame, Pasadena, Calif., concrete mix 1 : 1½ : 2. Weight of cover, 202 lb., of frame, 325 lb.

galvanized iron sections were replaced by using a common screw coupling at one end and a Dayton coupling on the other. The majority of the water services were of 1-inch copper pipe and it was proposed to cut out a section of each service and replace it with a copper-to-copper coupling at each end. However, just as good a repair job was obtained by uncovering the service for about 2 feet beyond each side of the proposed trench, making one cut in the center and bending up each end on an 18-inch radius, thereby saving a brass coupling on each water service and a very substantial amount of critical material.

The contractor, instead of tunneling and placing cement concrete encasement as described above, chose to jack a 48-inch reinforced concrete pipe under the railroad rights-of-way, allowing sufficient clearance to lay the 27-inch vitrified sewer inside to grade. One such jacking length was 60 feet. After the 27-inch pipe had been inserted and the joints cemented, the entire area between the outside diameter of the 27-inch pipe and the inside diameter of the concrete pipe was filled with cement concrete. This concrete was placed by puddling from one end until completely filling the opening at the other. In the case of the 60-foot length of tunnel, the required puddling distance was cut in half by dropping a shaft in the center.

An additional 200 feet of 27-inch pipe was cradled by the contractor at a cost of $200 in order to protect the safety factor of 1½, because loose, runny material was encountered at a depth of 20 feet which would have increased the pressure and thus reduced the safety factor.

Progress of the Work. The pavement was cut along the line of the proposed trench with a pavement breaker. The main trench, 4 feet in width, varying from 7 feet depth at the start to 28 feet at the finish, was excavated with a trenching machine capable of excavating to a depth of 33 feet. As the work progressed, it was found necessary, due to lack of space in the street area, to change from stockpiling the excavated material alongside the trench, to trucking it direct from the belt conveyor to the backfill, allowing approximately 200 feet of open trench for pipe laying. A stockpile was provided at the end of the job for the last 200 feet of backfill. Due to the depth of the trench and the soil structure, a large amount of shoring was required, which was held in place with pipe trench jacks.

The fill, mostly of gravel and sandy loam, was compacted by the flooding method, using approximately 1,040,000 gallons of water.

A ½-inch bituminous surfacing, or "dust-cap" was laid as soon as the fill would permit. This was followed in the course of time, when the final settlement had taken place, by the installation of a bituminous pavement in keeping with the type of pavement on the respective streets. The "dust-capping" and paving were done by the City of Pasadena's paving crew at the city's expense.

The superintendents on the job for the M. C. Nottingham Construction Company were Nick Mlagenovich and William Hanna, both veterans of many years in the field.

Price Trends in Highway Construction

Highway construction costs reached a war peak in the spring of 1943 and since have consistently receded, according to bid price data reported by the Public Roads Administration of the Federal Works Agency. Prices are still 43.1 index points above the 1940 level but even with this increase they are about at the level of 1923.

The Public Roads index of 100 corresponds to the cost of a mile of road composed of units of work representative of 1925-29 construction at the average unit bid prices of that period.

The remarkable advance in the development of road-building machinery and in the efficiency of contractors' operations produced a decline in the cost index from 117.9 in 1923 to 71.6 in 1940. War activity pushed the index up to 131.0 in the spring of 1943 but it receded to 114.7 in the spring of 1944.

Actual costs per mile are considerably higher than indicated by the index as the quantities of the composite mile remain fixed, whereas, gradual raising of standards has greatly increased the quantities in the average mile of highway, according to the Public Roads Administration.

The general downward trend in highway costs per unit of work between World War I and World War II was accomplished in spite of the upward trend of prices in general and more exacting requirements introduced in the past 25 years are the placing and compacting of fills in thin layers, accurate proportioning of aggregates for concrete, and smoother finishing of road surfaces.

The great advances made in grading equipment are reflected in the average price per cubic yard for grading. The average price dropped from 47 cents in 1923 to 18 cents in 1932, rose to 29 cents in 1934, dropped to 21 cents in 1938 and remained constant at that figure until war preparations caused a general upswing in prices. The war peak of 47 cents per cubic yard has already declined to 38 cents.

Soil Movements as Affecting Paved Surfaces

How the absorption of moisture and subsequent drying causes cracks in pavements. The mechanics of frost heaving, its effects on road surfaces, and methods for preventing them.

IN a recent article in "The Surveyor" (an English paper), W. H. Elgar discussed the nature of soil movements under paved surfaces, chiefly those due to moisture content (frost heaving not being so common in England as in the northern United States), their nature, causes and effects. Omitting references to certain English examples, Mr. Elgar's article was as follows:

"The water content in soil is constantly changing in the layers near the surface. At greater depths the changes are less pronounced and are generally slower.

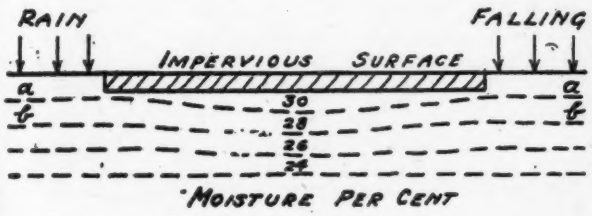


Fig. 1

"Fig. 1 shows diagrammatically a paved surface, such as a road, resting on a soil of fairly high permeability, and it is assumed that the ground is becoming wetter through rain falling on the surface. If the paved surface is virtually impermeable, the ground beneath it can only become wetter by moisture passing into it from the ground on either side. The lines a-a, b-b, etc., connect points in the soil with equal water content at any given time. Speaking generally, the ground under the paved surface will be drier at any level than the ground on either side of it. As the soil is permeable, the moisture will find its way through the ground fairly easily, and the lines a-a, b-b, etc., will have a small gradient. Or, in other words, the difference in water content at any depth below the surface will not vary greatly from the center to the sides of the road.

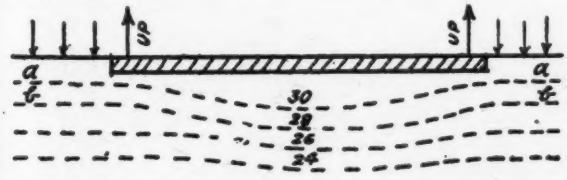


Fig. 2

"Fig. 2 shows a case similar to Fig 1, but with a more impermeable subsoil. Here the hydraulic gradient necessary to pass water through the soil will be much steeper than in the case shown in Fig. 1; or the difference in water content as between the soil under the center and sides of the road at any depth will be much greater. As the depth below the surface increases, the difference in moisture content as between the centre and sides of the road diminishes, until at some level it becomes the same.

Courtesy Dow Chemical Co.

1. Water below frost line draws upward through capillary action. 2. Small particles of water join other small particles, (3) become larger, (4) and larger, (5) forming ice lenses which expand and exert tremendous pressures, principally upward.

"If the subsoil is of such a nature that it undergoes a considerable change of volume with varying degrees of moisture content, such as occurs with clay, the greater swelling of the subsoil under the haunches will cause an uplift or tendency to uplift the haunches in relation to the centre of the road.

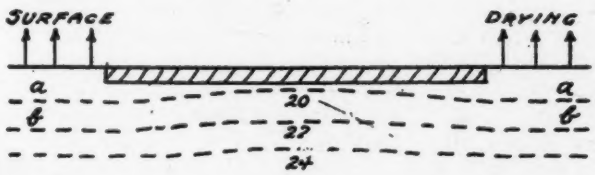


Fig. 3

"Figs. 3 and 4 show reverse conditions to those in Figs. 1 and 2; that is, the subsoil is in the process of becoming drier. The soil at the sides of the road is open to the sun and wind, and dries more rapidly than the soil under the road, and the lines a-a, b-b, etc., now slope downwards from the centre of the road towards the sides. Their slope is slight in Fig. 3, where the transference of moisture through a permeable soil takes place with comparative ease; and

is steeper in Fig. 4, where the subsoil is less permeable and the transference of moisture is slower.

"Considering Fig. 4, if the soil is clay and subject to considerable volume change, there will be a greater subsoil shrinkage under the sides than under the centre of the road, with a tendency to lower the sides in relation to the centre.

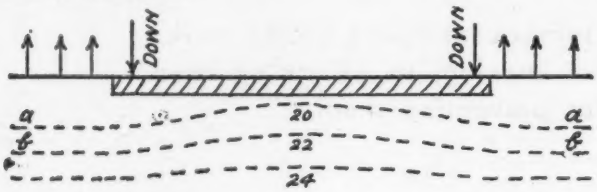


Fig. 4

"This upward and downward movement of the haunches, as illustrated in Fig. 2 and 4, tends to make them crack away from the centre of the road, which is not subject to so great subsoil movement. The horizontal expansion and shrinkage of the subsoil also subjects the road to tensile stresses which it is often not designed to carry. When the subsoil is becoming wetter, as in Fig. 2, the uplift of the haunches tends to close any cracks which may have formed, whereas in Fig. 4 the sinking of the haunches opens out the cracks. For this reason cracking is generally seen in dry rather than in wet weather.

"Clay subsoil has been used to illustrate this action, but similar movements occur under roads on sand, which is subject to 'bulking' with changes of water content.

"Subsoil drainage of the roadbed will reduce these movements, but a simple roadside ditch may in some cases worsen conditions if it increases the rapidity with which the subsoil under the haunches dries out in relation to that under the centre.

Frost Heaving

"Frost heaving appears to be more severe in gravel than in other subsoils. This statement is based on the author's own limited experience, and may not by any means be generally true.

"In a long, severe winter some years ago the author carefully watched the action of frost on two similar roads adjoining each other, the first being sited on coarse loamy gravel and the second on dense brick clay.

"The effects of the frost appeared much sooner, and were much more severe, in the road on the gravel subsoil than in the road on the brick clay.

"Water contained in a coarse-grained soil is practically in a free state, and reacts to the effects of frost with comparative ease. The water in a clay subsoil, being split up into tiny particles dispersed throughout and protected by the dense mass of the clay, does not react to frost so readily.

Fig. 5

"Fig. 5 shows a cross-section of the two roads, and a-a are the points where the first and most severe cracks due to frost occurred. The reason for this is that the footpath was comparatively thin, and the subsoil below froze rapidly and heaved up, whereas the soil under the curb was at a greater depth, and was protected from the weather and held down by the thick mass of concrete which prevented or delayed the freezing action. On one side of the road upon gravel soil were houses built up to the back of the footpath, and on the other side gardens intervened. On this latter side of the road, where the adjoining soil was not protected from the weather, frost action occurred earlier and was more severe. In the case of the road on clay, neither side was protected by houses right up to the path line, but, as previously stated, frost action was much less.

"The line of fracture a-a was a few inches behind the curb. Later, similar cracking occurred at b-b a few inches into the carriageway from the gutter.

"Cracking of a concrete road, if due to poor workmanship or materials or faulty design, usually occurs in all directions, but largely across the width of the road and along the haunches. Cracking due to soil movement is usually longitudinal, and occurs some little distance in from the edges. More or less rectangular areas, such as school playgrounds, do not exhibit so much regularity.

"Longitudinal cracking is usually less on roads with a substantial curb than on uncurbed roads. This is generally attributed to the supporting action of the curb in buttressing up the haunches. This is no doubt true, but in the author's opinion part of the action is due to the concrete beneath the curb, which act as a sort of 'cut-off' to some extent, isolating the subsoil beneath the road from that outside. This isolation helps to keep the moisture content beneath the road more constant and less subject to great changes in varying types of weather, and, as mentioned earlier, it also gives protection against freezing.

"Isolation of the subsoil beneath a road may also be

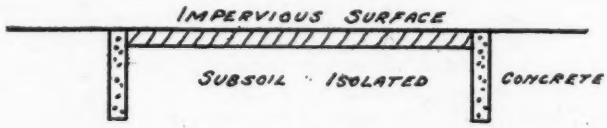


Fig. 6

affected by carrying down a thin concrete wall under either side, as in Fig. 6. Not only is the subsoil isolated from outside surface conditions, but the paths which moisture has to follow in passing in either direction is much lengthened, and the resistance increased. The difference in water content as between the soil under the centre and that at the sides of the road is reduced, and remains more constant with changing climatic conditions.

"With concrete carriageways, the extension of the slab outside the actual carriageway will have the effect of bringing the point at which cracking due to soil movement is most likely to occur nearer to the side of the road.

"Figs. 1 and 2 show a simple case of soil becoming wetter through absorbing moisture from rain on the surface, and Figs. 3 and 4 a simple case of soil becoming drier through the action of sun and wind on the surface. In most cases the distribution of moisture would be more complex. For instance, at the commencement of rainfall the surface soil would be wetter than that a little deeper, and at greater depths it would again be damper. Variations in the type of soil at varying depths and subsoil drainage would also complicate matters.

"The stabilization of the soil under and adjoining the road and adequate subsoil drainage are the best preventives of excessive soil movement. Over-drainage

(Continued on page 46)

Reworking a Diesel Engine

Making main bearing caps keep tight. Replacing and re-adjusting crank pin and main bearings.

E. E. Didier

By ERNEST E. DIDIER
Superintendent, Osage City, Kansas, Municipal Light and Power

ABOUT three years ago we purchased a Diesel engine, and had fairly good success with it (that is, after combing out a few bugs such as most new engines have) until about a year ago, when we began having trouble holding the main bearing caps tight. This model does not have main bearing bolts, but the cap is held on with jack screws which sit on top of the cap and bear against the A frame, as illustrated in Figure 1. The upper part of each screw rests in a shallow socket with an oversize hole in the upper cap, permitting it to find its own center. These screws are provided with a locknut, but would screw down no matter how tight this nut was. We also found that after they came loose they would let the upper boxings play in the frame, and showed bright spots of wear on them. We made an effort to correct this, as will be told later.

Shortly after this we began to find small particles of bearing metal in the bottom of oil case, and kept a close watch on the oil pressure, until one day it began to drop too rapidly and the engine was shut down; then, by putting pressure on the engine by means of a hand pump used in priming, we noted where the oil was coming out. On dismantling the engine, we found that several of the crankpin bearings were literally falling apart; they didn't show on close inspection that they had worn or flattened out, but looked as though they had not been bonded together correctly. After taking out the crankpin bearings, the main bearings were examined and two of them were found to be in the same condition. Also two others had a crack running in the same direction as the crankshaft; these were put back in until such time as we can have the two being re-run to replace them.

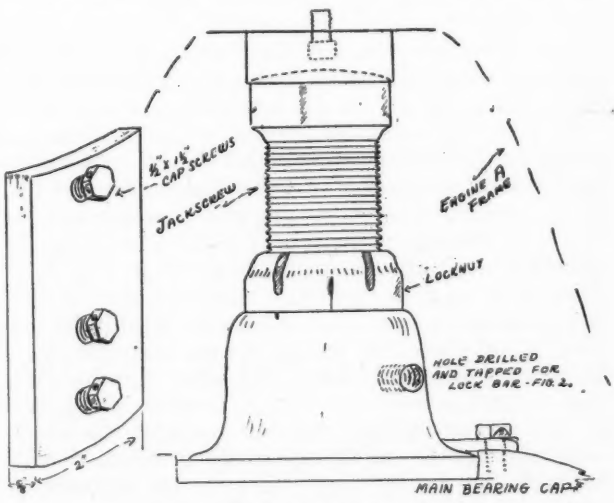


Fig. 1. Bearing cap jack screw.

When the bearings that had been sent to be re-run and rebored at the factory came back, additional help was used to help lift them in and out for fitting upon the shaft, and the shaft was dressed down with a No. 2 hone and kerosene. When using the bearing blue we looked to see if shaft was level in the up position; then, when the upper bearing and the lower half were fitted to the shaft, to see that it was as near level as possible. This saves a lot of trouble in fitting the rod so that it has proper clearance on each side of the piston pin box through the complete revolution of the engine; by that I mean that the rod does not ride one side of the piston and cause overheating or sticking.

Another thing that was done, upon instructions from a factory representative, was to place steel shims, varying in thicknesses from .003 to .005", between the main bearing boxes and the frame and then tightening the screws; after which, home-made locks, as shown in Figure 2, were put on in an effort to hold these in place. These have proved fairly satisfactory, but a constant watch must be maintained even then. We are now expecting some different locks from the factory, but I am told that "Uncle Sam" takes them as fast as they come from the production line.

In replacing the lower halves of the main bearing shells, a bridge gauge was used to determine the amount of wear the other bearings had, and the new ones were scraped to the amount marked on frame, plus this wear. We also used a strain gauge.

This particular engine is equipped with a Woodward type governor, than which I believe there is none finer made for this type of engine, using the solid injection system. Nathan lubricators are used, with a Brown and Sharpe lubricating oil pump. (One of these pumps has been on one of our units for sixteen years, and has never been dismantled.) We have been using a De Laval Centrifuge oil cleaning system on all our engines, but intend adding some filters along with it

to bring the oil up to color, and also to catch some of the finer particles.

We use an open type spray pond for water circulation, and find that one of the evils of this system is the formation of algae. By proper treatment we keep this to a minimum, but I believe it forms more scale in the engines than necessary, and shortly we are going to treat this engine with a solution made by the Oakite Company.

While this engine was dismantled we put in some new rings made by the Double Seal Ring Co., having used these rings for years and finding them very satisfactory.

There are certain things that every superintendent would like to find in an engine that he buys. These are some that are on my mind: Main bearing bolts; bevel or herringbone cut gears, or silent chains; doing away with small water piping, which eventually scales and fills up; not too high speed, as the noise factor generally increases with speed, and this certainly wears on the operators and the superintendent. Noise is one of the major factors I believe the engine companies should not overlook.

Non-Skidding a Pavement in Rye, N. Y.

By RAYMOND W. MURPHY

City Engineer, Rye, N. Y.

IN September, 1943, Rye, N. Y., laid an experimental length of rock asphalt on 250 ft. of the Boston Post Road at the Purchase Street intersection (where there is a traffic light) with the hope of curing a slippery condition at this point. The road here was 36 ft. wide and paved with concrete. It was on a curve of less than 500-ft. radius and the grades were 4.6% and 6.6%.

The cement-sand mixture among the stones was worn away to such an extent that the stones protruded a quarter of an inch and these were worn smooth so that the surface presented one almost like billiard balls laid on a plane. Because of oil drippings, the entire surface was further lubricated. When trucks applied brakes on this grade and curve, when the pavement was wet, they sometimes skidded; trailers sometimes jack-knifed; brakes always screeched (our office is at this point less than 100 feet away). Many minor accidents were common and a few costly ones happened.

In 1927 the village had placed a rock asphalt pavement on Elizabeth Street (then Crooked Street). This is a short street of sharp reversed curves on grades exceeding 10%. No maintenance treatment has ever been given it and it is as good today as when laid. It is practically non-skid even when wet. I have driven as fast as the grade and curve would allow (about 35 m.p.h.), slammed on the brakes — no skidding took place. Because of this experience the village chose the same material for the Boston Post Road at this point, where the truck traffic is possibly as heavy as any place in the nation.

The method of treatment was as follows:

a. The entire area was scrupulously cleaned with gasoline to remove oil film.

b. First a fog-coat (1/10 gallon) of Bitumuls emulsion was applied. Then a second fog-coat (1/10 gallon) of Bitumuls emulsion. This point, we think is important. We feel that a double dose is better than a single one, just as in gluing two pieces of wood. The amount used was the minimum possible.

c. 1½ inches, loose, of rock asphalt was spread and rolled to one inch thickness.

This surface has been down a year and is in excellent condition, there having been no creeping whatsoever. Skidding has been reduced to a minimum—in fact I have heard of none.

Preparation of Graphs

In our October issue we published, through the courtesy of the English paper, "The Surveyor," an article entitled "Correct and Incorrect Preparation of Graphs." We have received from Clinton L. Bogert, a consulting engineer of New York City, the following criticism of this article:

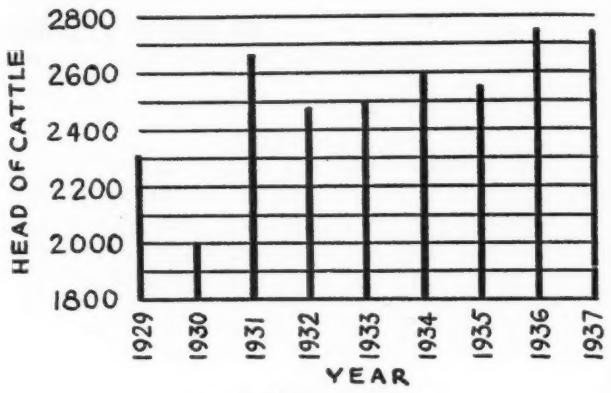


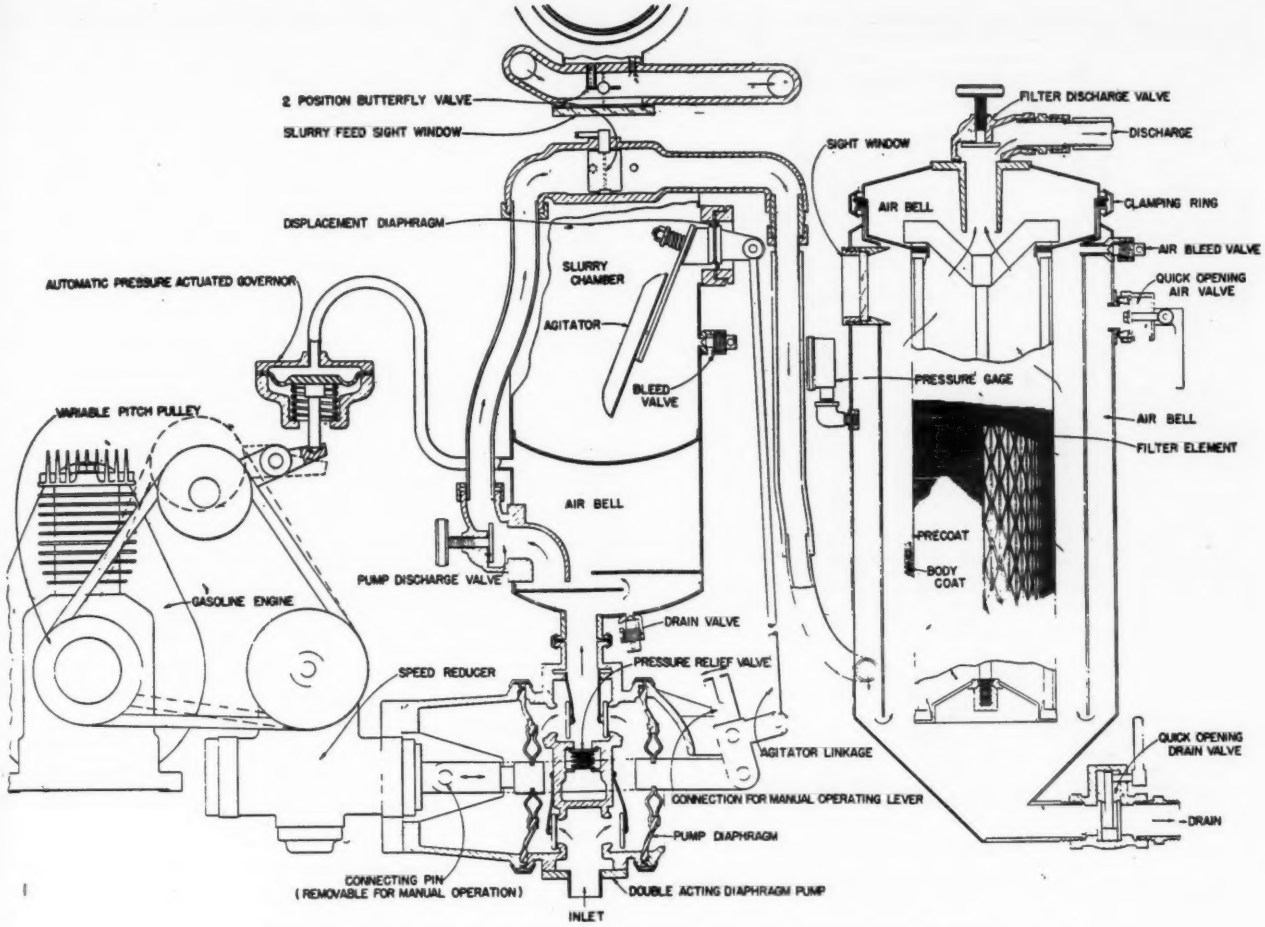
Fig. 2. Correctly drawn.

"I am greatly interested in 'Correct and Incorrect Preparation of Graphs' in the October 1944 issue, but question whether Fig. 2 on page 27 is correctly prepared. It is my contention that statistics for equal time intervals should be represented by isolated vertical lines equally spaced. In Fig. 2 an unwary reader may conclude that on December 31, 1931, there were 2,570 head of cattle, since this interpolation can be made on the sloping line connecting 1931 and 1932. Such a blunder is not possible where an isolated vertical line for each year is used."

Controlling Distribution System Pressures

(Continued from page 13)

The lower diagram indicates what usually are the pressures in a distribution system under different conditions. The line (1) is the hydraulic gradient in the system during periods of average or low consumption. The only drop in pressure is that due to friction loss governed by the amount of water flowing through that particular distribution system, static level remaining constant. During periods of peak consumption, the standpipe not full, the hydraulic gradient line in the same area has gone down to a minimum of 10 pounds per square inch (line No. 2). It may readily be seen from this that the flow pressure is not adequate, nor is the static pressure adequate. The answer to this problem which has been discussed in previous paragraphs is indicated on line (3), showing that when the booster station No. 2 is on, the hydraulic gradient remains through the entire distribution system at approximately 30 pounds per square inch.



Schematic diagram of diatomaceous water purification unit, Squadron Type M-AF.

Diatomaceous Earth Filters for Water Purification

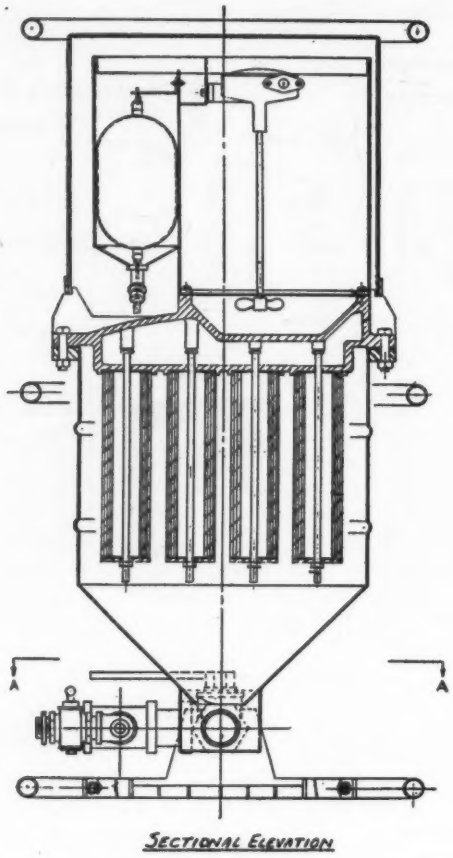
Recent adaptations to purifying water for troops by portable units suggest the possibility of developing them for use for relatively clear public water supplies.

TO MEET certain war-time needs of the armed services, diatomaceous earth filters have been developed for field purification of water. These filters possess some advantages over the pressure-type sand filters hitherto used by our services in the field, and there is considerable interest in the possibility of their use for municipal water purification, either as pressure filters or adapted to gravity operation. These diatomite filters are not, of course, new. They have been used widely in industrial processes and operations for many years, and nearly all foreign armies have been using them for a number of years for field water purification.

In regard to their use for filtering public water supplies, not many facts are available. It appears, on the basis of established data, that these diatomite filters will yield a safe and excellent appearing water; that they may require fairly skilled operation; and that the cost of operation may be higher than with modern gravity-type sand filters. In comparison with pressure-type sand filters, the advantage appears to be rather heavily on the side of the diatomite filters.

The possible disadvantages cited above may not prove important. Any plant that produces drinking water is of enough importance to warrant skilled and careful operation, and perhaps this should be of a higher grade than that considered permissible in the past. The apparent higher cost of operation is based on limited experience in the amount of diatomaceous earth required, and on present prices.

An important advantage of the diatomite filter is its ability to remove cysts of *E. histolytica*, the causative agents of amebic dysentery, and also the organisms causing schistosomiasis. Properly operated gravity sand filters will remove ameba cysts and should re-



Section of a 50 gpm filter unit assembly. Weighs about 350 lbs.

move the cerceriae causing schistosomiasis. Pressure sand filters as normally operated—that is, with inadequate pretreatment and at rates above 6 gallons per sq. ft. per minute—cannot be relied on to remove these organisms. Diatomite filters are no more effective in the removal of bacteria than are properly operated gravity sand filters. Since diatomite filters are extremely effective in the removal of turbidity, they can produce a clear water with or without pretreatment. However, from a practical viewpoint, very careful pretreatment of the water is necessary due to the large amount of diatomaceous earth required to filter waters of even moderate turbidity.

It is possible that the diatomite filter will find a place in the treatment of relatively clear waters, provided initial costs can be kept low. With clear waters, reliance is often placed on storage and chlorination to attain the required degree of purification. Chlorine, in the small doses usually applied, will not destroy ameba cysts; break-point or super-chlorination destroys them effectively, but not enough municipalities have adopted these methods. No one knows how important amebic dysentery will be after the war. It has been estimated that around 8% of our population are carriers of ameba cysts, but for some reason amebic dysentery has not been an important disease in this country; and experts are unable to determine or agree on the reason. Soldiers returning from the Pacific, Africa and Asia will bring a new seeding of amebic dysentery, which may possibly make the disease more important than in the past. If such should be the case, even though break-point chlorination should be adopted more widely (as it ought to be), there would still be supplies where the diatomite filter would be desirable to remove occasional or regular turbidity and allow the use of activated carbon. The extent to which such filters may be used depends on the way in which they develop in the near future.

No large filter plants utilizing diatomaceous earth have been designed, so far as is known, and it is doubtful if sufficient data are available on which to base design. A few facts are known. The space required would be smaller than for standard sand filters, due to the higher rate of filtration—about 5 gpm per sq. ft. Initial costs would probably be lower. On the basis of present experience with small units, a pound of filter aid is required for each 1,000 to 1,250 gallons of water filtered, that is, 800 to 1,000 pounds per million gallons, based on a turbidity of the applied water of not more than 10 ppm. Careful pretreatment of the water may reduce the amount of filter aid; but since higher turbidities rapidly increase the usage of filter aid, and these filters appear to be sensitive to sudden variations in the quality of the water, good operation is always necessary.

Diatomite consists of the skeletal remains of diatoms, more or less fragmented. This material, selected and calcined for use as a filter-aid, has particle sizes generally varying between 0 and 50 microns, at least 70% between 2 and 20 microns. This filter-aid is used in thin coats .06 in. thick or more, deposited on a supporting base or septum, which usually has the form of a number of cylindrical tubes arranged with an inch or so clearance around each in a filter shell. The water to be filtered passes from outside, through the filter-aid and septum to the inside of the tube and out at one end.

Backwashing is simple with diatomite filters, requiring only a reversal of the flow of water not greatly in excess of the normal operating rate; wash water should not exceed 2% of the water filtered. In general, it is believed that controls will be needed essentially similar to those now employed in connection with the operation of sand filters. Also, in order to feed the filter-aid properly, some additional feeding equipment of a relatively simple nature may be required.

A diatomite filter of the pressure-type consists of a shell, generally similar to the shell of a pressure sand filter, with one or more septa or supports for the filtering layer of diatomaceous earth, valves, piping and controls. A suspension of diatomaceous earth is circulated through the filter to form an initial thin layer on the surface of the septa. This layer is deposited to a depth of 1/16 to 1/10 of an inch, representing 0.10 to 0.15 pound per sq. ft. of surface. Filtration is then begun, and as it proceeds more filter-aid (diatomaceous earth) is added as a body-feed during the process of filtration. This results in greater economy in filter-aid, as a porous mat is built up on the surface of the septum by the gradual deposition of diatomaceous earth and of suspended material removed from the water by the filter. This method of continuous application of filter-aid does not improve the quality of the water but does increase the length of filter run while decreasing overall consumption of diatomaceous earth. The reason for decrease in use of filter-aid is the fact that the composite layer of filter-aid and removed suspended matter is more porous than the mat that is formed on top of the original layer of filter-aid by the material filtered out of the water. If desired, activated carbon may also be added to the composite mat.

Various types of septa or supports are used, all of which are cylindrical in shape, the length and diameter determining overall capacity, though the character of

(Continued on page 49)

Celina, Ohio, treatment plant. The outlet, Beaver Creek, at right center. Grand Lake in the background.

Charges to Industries for Treating Their Wastes in a Municipal Plant

Apportioning between industries and the municipality the cost of complete treatment of milk and canning wastes combined with domestic sewage at Celina, Ohio.

By PAUL A. UHLMANN
Paul A. Uhlmann & Assoc., Consulting Engineers, Columbus, Ohio.

WHEN the new sewage treatment plant at Celina, Ohio, was officially put in operation in December 1939, considerable doubt was expressed by various groups about the possibility of treating the unusually heavy industrial wastes efficiently and economically in connection with the domestic sewage from a population of 5,000.

Since the initial operation of the plant, i.e., during a period of nearly five years, the operating records have shown that it is possible to include disproportionately large industrial wastes in a municipal sewage treatment plant, using the activated sludge process for complete treatment, without creating a financial burden to the citizens.

10 ft. of foam over aeration basins. This happens when tannery forgets to cooperate. Effluent trough shows at bottom of picture.

Necessity of complete treatment. Due to the low flow in the receiving stream throughout the year, it was imperative to give all wastes complete treatment, either in two separate plants, i.e., one plant treating domestic sewage combined with only creamery and stearic acid wastes, and one plant treating canning wastes only; or in one plant treating the combined wastes. After a thorough comparison of the advan-

In the March 1943 issue of PUBLIC WORKS Mr. Uhlmann described the Celina plant and the results of three years' operation of it. Briefly summarized, the plant includes a coarse screen, comminutor, flash mixer and flocculators, primary settling tanks, sludge digester, sludge beds, aeration tanks (activated sludge), 2 motor driven and 1 gas engine-driven blowers, and final settling tanks; a sludge pump, 2 sewage pumps and a storm water pump. Heat for the digester is obtained from a gas-fired boiler. The plant was designed hydraulically for a total flow of 900,000 gpd of combined wastes. The total cost, including landscaping, was $106,000. The chemicals used are lime and ferric sulphate. In 1943 the flow, by monthly averages, ranged from 425,000 gpd in December to 1,418,000 gpd in May. The 5-day BOD in the effluent varied from 5.9 ppm in August to 17.0 ppm in March, and the D.O. from 4.3 to 5.5.

	Wastes	1942	1943
Pounds of BOD removed	Combined Wastes	928,400#	730,340#
	Industrial Wastes	618,150#	420,090#
	Domestic Wastes	310,250#	310,250#
Total Operating costs per year	Total Operating Cost (combined)	$6751.58	$6572.25
	Present Charges to Industries	$2400.00	$2400.00
	Net Operating Cost to Village	$4351.58	$4172.25
Population Equivalent	Combined Wastes (Popul.)	15,000	11,800
	Industrial Wastes (Popul.)	10,000	6,800
	Domestic Wastes (Popul.)	5,000	5,000
Cost per capita per year	Combined Wastes (Total Popul.)	$0.45	$0.56
	Cost to Industries	$0.24	$0.35
	Net Cost to Village	$0.87	$0.83
Cost of 1000 pounds of BOD removed (Combin. Wastes)		$7.30	$9.00
Present Operating Cost to Industries per day		$8.00	$8.00

Amount of wastes treated at the Celina plant and cost of treatment.

tages and disadvantages of each plan, the complete treatment of all wastes combined in one plant was adopted.

Types of industrial wastes. The industrial wastes originate in three different industries. The largest contributors are the Crampton Canneries Inc., canning green vegetables as asparagus, peas, beets, potatoes, tomatoes and dry vegetables as beans and hominy. During the current year, the wastes from the kraut and pickle packing plant also were connected to the treatment plant.

The next largest waste producer is the Producer Creamery, a milk powder plant. The wastes from this industry are especially troublesome during the months of May and June, when soured milk has to be dumped in large batches.

The third type of industrial wastes is periodically discharged by the Stearic Acid Company, lowering the pH of the sewage to very low figures.

All industries work throughout the year at maximum capacity. The sizes of the various packs of the canning company are unpredictable, being regulated only by the yield of the crop, keeping the operators of the sewage treatment plant on a continuous alert. During the peak of the tomato pack the treatment plant is taxed to its full capacity, especially when the fine screen at the canning company breaks down or does not operate properly.

Population equivalent of the industrial wastes. According to the operating records for the years of 1942 and 1943, the average population equivalents of the combined wastes were 15,000 and 11,800 respectively. Assuming a village population of 5,000 the population equivalent of the industrial wastes alone were 10,000 and 6,800 respectively.

These figures are yearly averages only; the continuous fluctuation in flow and strength of the incoming wastes causes considerably larger changes in the daily loadings.

Charges to the industries. For the complete treatment of their wastes regardless of flow or season, the canning company is paying, at the present time, a lump sum of $2,000 per pear, the creamery $350 and the stearic acid company $50 per year. In other words, a total of $2,400 is being paid by the industries for the complete treatment of all industrial wastes, regardless of the amount dumped.

Considering the population equivalent of the industrial wastes, these charges appear to be quite low in comparison with the net costs to the village. But, however paradoxically this statement may sound, the fact is that a scrutiny of the breakdown of operating costs will confirm that the present arrangement about the various shares of operating costs is fair to both parties, the village as well as the industries.

If the shares of operating costs would be based on the population equivalents only, the industries might be overburdened while the village would unduly benefit from the inclusion of the industrial wastes.

Operating costs. The operating costs include pumping costs and, of course, all other costs necessary for the proper operation of the plant, including repairs. An additional saving of $200 per year could be made if a larger gas engine should replace the present small engine, thereby eliminating any waste of sludge gas.

The breakdown of the yearly operating costs of 1942 and 1943 as shown in the accompanying table reveals that the cost of BOD removal was $7.30 and $9.00 respectively per 1000 pounds of BOD removed. These costs appear to be very reasonable in view of the problems involved.

Scrutinizing the per-capita-per year costs, especially the actual costs to the village after deducting the charges to the industries from the total operating costs, the actual net costs to the village are seen to be $0.87 per capita per year for the year 1942 and $0.83 per capita per year for the year 1943 which cannot be considered excessive either. In fact, these figures are lower than most of the per capita costs of other villages and cities that give similarly complete treatment. In spite of the fact that they include costs actually chargeable to the industries, they could scarely be lowered if the village should exclude entirely the industrial wastes and treat domestic sewage only.

On the other hand, it might become a financial burden to the industries if the charges for treating their wastes were based on the actual population equivalent of these wastes, which would reduce the net costs to the village to a ridiculously low figure. After all, industries are an asset to any community and deserve some consideration if this does not involve any financial sacrifices by the taxpayers.

Therefore, it may be concluded that the present charges follow closely the golden rule, that is, the industries receive a benefit from the village for which the citizens do not have to pay at all, because the costs to the citizens would be the same if domestic sewage only had to be treated.

The industries could never maintain a waste treatment plant of their own at their present cost of only

SEWAGE TREATMENT PLANT - CELINA - OHIO

ABBREVIATED SUMMARY OF OPERATING DATA FOR 1943.

FIGURES REFERRING TO FLOW AND LAB. ANALYSIS ARE MONTHLY AVERAGES; ALL OTHERS ARE TOTALS.

MONTH	AVE. DAILY FLOW 1000 GAL.	SUSP. SOL. RAW PPM	SUSP. SOL. FINAL PPM	SETTL. SOL. RAW cc/liter	SETTL. SOL. FINAL SETT. cc/liter	5 DAY BOD RAW PPM	5 DAY BOD FINAL PPM	OVERALL BOD % REDUCTION	D.O. FINAL	pH RAW	pH FINAL	SLUDGE GAS 1000 CU.FT.	INDUSTRIAL WASTES CANNING HRS	INDUSTRIAL WASTES MILK 1000 lbs	CHEMICALS USED LIME tons	CHEMICALS USED IRON lbs	EL. POWER CONSUMED ACTIV. DAILY 1000 KWH	REMARKS WASTES TREATED
JAN.	627	367	11	10.0	0.6	357	11.0	97.0	5.5	5.9	7.2	288		20		0.03	20	MILK
FEB.	648	269	10	9.1	0.4	362	10.7	96.1	4.5	6.3	7.3	249					28	
MAR.	877	205	16	4.1	0.4	386	17.0	91.7	5.4	5.5	7.1	241					5.7	
APR.	664	255	10	10.9	0.8	427	8.9	96.5	4.9	6.4	7.2	234		13	0.12	0.06	6.7	MILK
MAY	1818	200	19	5.0	1.8	382	11.1	94.5	4.3	6.3	7.2	216		83			6.8	MILK
JUNE	696	330	9	10.3	1.1	482	8.8	97.3	4.6	5.8	7.2	289	113	63	1.88	0.51	10.1	MILK - PEAS
JULY	707	357	13	8.1	0.4	439	9.0	97.5	4.4	5.6	7.2	391	171	7	3.60	1.37	11.7	MILK - PEAS - BEAN - POTATOES
AUG.	793	352	9	8.7	0.9	414	5.9	98.3	4.6	5.3	7.3	296	249	2	4.83	1.65	8.6	MILK - TOMATOES - BEANS - POTAT.
SEP.	586	380	12	14.2	0.3	395	6.1	98.4	4.9	5.0	7.4	372	387	6	7.77	2.89	17.0	MILK - BEETS - TOMATOES - POTAT.
OCT.	515	371	18	13.3	0.2	529	7.3	98.4	4.9	6.2	7.1	369	233		5.37	2.27	12.0	BEETS - TOMATOES - BEANS
NOV.	524	445	9	12.0	0.2	560	12.5	97.2	4.6	5.8	7.2	325	161		3.35	1.51	6.9	BEETS - BEANS
DEC.	425	269	12	8.2	0.7	395	10.5	96.1	4.6	6.8	7.1	326	110		2.28	0.96	1.9	BEANS

Flow
Full treatment..206 mg
Primary treatm. 13 mg
Total .....219 mg
BOD removal by full treatment: 730,340 lbs.

Operating Costs
Salaries ...$3,505.81
El. Pow.... 1,638.00
Chemicals.. 522.48
Misc. 905.96
Total ...$6,572.25

Electric Power
Pumping ...71,600 kwh
Activation..92,200 kwh
Total...163,800 kwh

Chemicals
Lime.....29.2+ $287.72
Ferric Sulph. 11.3+ 234.76
Total.....$522.48

Sludge Gas Consumption
Gas Engine (8312 hrs.)..2,755,100 cu. ft.
Boiler ..... 298,700 cu. ft.
Chem. pretreatment..... 55,600 cu. ft.
Wasted ..... 487,000 cu. ft.
Total ..... 3,596,400 cu. ft.

Yearly Averages and Totals for 1943 and 1942

Year	Flow Full Treatm.	BOD Removed	5 Day BOD Raw	5 Day BOD Final	5 Day BOD % Reduct.	Cost Per Pound of BOD Removed Salaries	El Power	Chemicals	Sludge Total Prod.	Gas Engine Cons.	Engine Running	KWH Recovered
1943	206 mg.	730,340 lbs.	426	9.9	97.6	0.480 cts.	0.224 cts.	0.071 cts.	3,596,400 cu. ft.	2,755,100 cu. ft.	8,312 hrs.	110,000
1942	187 mg.	928,400 lbs.	605	16.9	97.1	0.367 cts.	0.223 cts.	0.088 cts.	4,130,300 cu. ft.	2,574,000 cu. ft.	8,432 hrs.	103,000

Year	Population	Popul. Equivalent Combined Wastes	Operating Costs	Cost Per Lb. of BOD	Breakdown of Operating Costs Salar.	Power	Chem.	Misc.
1943	5000—	11,800	$6,572.25	0.900 cts.	53%	25%	8%	14%
1942	5000—	15,000	$6,751.58	0.730 cts.	50%	31%	12%	7%

REMARKS
New Waste Treated: Potatoes

$8.00 per day. By combining municipal and trade wastes in one plant which has sufficient flexibility to cope with all fluctuations and shock loads, it was possible to obtain maximum efficiency at minimum costs.

Close cooperation essential. The continuously high efficiency of the plant cannot be achieved without close cooperation from the industries. Screening of the canning wastes prior to the dumping is imperative, as a breakdown of the screening mechanism will result in the dumping of truck loads of rotten tomatoes and tomato pulp directly to the plant, which is not equipped to handle unscreened wastes.

City manager F. D. Kuckuck, who has jurisdiction over all utilities, power plant, water works and sewage treatment plant, fully recognizes the importance of keeping the sewage treatment plant in first class shape and therefore he encourages and approves any suggestions from the superintendent, Carl Bauer, for minor improvements or refinements at the plant. Superintendent Bauer and his capable assistant, Dale Hamilton, are making every effort to introduce further savings and refinements in operation, such as controlled gas production, etc., in order to reduce the operating costs to an absolute minimum and maintain the high plant efficiency.

Stream Conditions. Up to five years ago, Beaver Creek carried a foul black liquid which, from August on, changed its color to a tomato red when unscreened tomato wastes were dumped into it. Fish life was nonexistent. Today, the sludge banks have disappeared, the waters are running clear, and turtles and fish are being caught again below the outfall from the plant.

Summary. A general review of the operation of the Celina plant for a period of nearly five years leads to the following conclusions:

1. It is possible and also economical in many cases to combine canning wastes and milk wastes with domestic sewage for complete treatment, even if the ratio of industrial wastes to domestic sewage is disproportionately large.

2. The operating costs for the complete treatment of such wastes combined with domestic sewage can be kept at figures very reasonable for all parties involved.

3. Close cooperation by all interested parties and flexibility in plant operation are highly essential factors if a continuously high plant efficiency is to be achieved. Some kind of pre-treatment units acting as shock absorbers and protecting the secondary treatment units against overloads appear indispensable.

It may safely be predicted that the successful operation of the Celina plant can be easily maintained, for many years to come, at the same high level even if the canning industry should expand considerably. At any rate, the pollution of Beaver Creek is a thing of the past and everybody seems to be satisfied with the solution of the problem.

Sewage Treatment Problems Require Thorough Investigations

By WILLIAM S. LOZIER

Consulting Engineer, William S. Lozier, Inc.,
Rochester, New York

THE pollution of our lakes, streams and rivers by the discharge of raw sewage or industrial waste into them will soon be completely prohibited. Every State now recognizes that this menace to health must be controlled. To the South of us, our neighbors are also becoming interested in sanitation. Recently six Latin American republics entered into an agreement for extension of inter-American health and sanitation. This agreement calls for an appropriation of $16,250,000 in joint funds to carry out the program. After this war the countries of Europe and Asia are expected to start a program of sanitation. This country has already started a program of huge postwar projects, which involve the expenditure of large sums of money for sewage and industrial waste disposal. The United States Public Health Service estimates that the sum of $2,255,150,000 will be expended for additional sewage disposal facilities.

The postwar period will present to the sanitary engineers of this country an opportunity that will be greater than any heretofore faced. In meeting the demand for treatment works, before the basic design is prepared, a thorough investigation of what method to use should be made. The science of sewage treatment has now reached a development where with a properly designed plant the results to be obtained can definitely be determined.

The method of approach in designing sewage treatment works has varied considerably in the past twenty years, due to a more exact knowledge of the processes at work. There are certain fundamentals that were used in the past that should still be used in the design of new sewage treatment plants.

In recent years many patents have been granted for new processes and for new types of equipment. Some of these have proven very satisfactory, while others do not meet the claims made for them. Before using any process or any equipment, the engineer should satisfy himself that they have been thoroughly tried and tested, and that they will produce the results claimed for them. The considerable number of plants constructed at the various military establishments and the operation of these plants clearly shows that a better degree of purification could have been obtained by much simpler methods than some of those used. The troubles in operation and the initial cost would also have been reduced. The experience of the past shows that the methods of treatment and processes and equipment used must be evaluated.

A treatment works need not be complicated to dispose of sewage or industrial waste. It is not possible to call for a combination of processes in a haphazard way and expect the treatment works to function properly. The use of a lot of elaborate and unnecessary equipment will not insure good results in treatment. One of the fundamentals, and an important one, is that in designing a plant the designer should bear in mind that the plant operation should be as simple as possible. Much worry will be avoided if this is kept in mind. A plant should be flexible to meet any unusual flows that may occur or any sudden changes in the character of the influent. Flexibility tends to simplify operation and reduce operating cost. A thorough knowledge of the characteristics of the sewage or industrial waste must be obtained before adopting any method of treatment. The capacity of the stream into which the effluent is to be discharged must be studied in order to avoid any unsatisfactory conditions in the stream below the point of discharge.

The size of the municipality is important in determining the method of treatment to use. A small community can not afford a complicated treatment works or the use of elaborate equipment. It can not afford the duplication of units that is often required in a more extensive works. The funds available for the salary of the operator are usually kept to a minimum. A treatment works consisting of sedimentation, sludge digestion, trickling filter and sludge beds will usually suffice for a small community. A treatment works of this character is not complicated, has a small amount of mechanical equipment, and will produce an effluent that is highly stable. The operator of such a plant need not be a chemist or sanitary engineer. A man with a public school education can be trained in the fundamentals necessary in operating. If he has mechanical ability, it is desirable.

For larger municipalities, the treatment works will necessarily be more extensive. Here again basic processes that have proven their worth should be used. No process or equipment should be introduced, except those that are known to be efficient and will perform the duties for which they are intended. Duplication of some of the units and equipment is necessary to avoid serious interruptions in the flow. The works should be flexible and the operation kept as simple as possible. The operating staff in a large treatment works should include a sanitary engineer and chemist. Operating cost will be kept to a minimum if complicated methods are avoided.

Methods in sewage treatment have changed rapidly, very often due to a stimulation by equipment manufacturers or process developers. This causes the designer to forget that one method of treatment is not a cure-all. Each project is a problem in itself, and the method adopted for one city will not answer for another. Much of the difficulties can be overcome if the engineers adopt as a fundamental, that each problem requires adequate investigation, and that the process to be used must be studied for each separate project. This can not be repeated too many times.

Cement-Grouted Pavement

Low-cost concrete surfacings have been constructed successfully in Chicago by means of the cement grouting method. The work included a surfacing carrying heavy traffic with lanes 13 ft. wide and 10 in. thick. Grout consisting of 1 part Portland cement and 2 parts lake sand was mixed in a steel mixing box, discharged through a gate in the side on to a compacted layer of coarse broken stone and spread by brooming. Wire netting placed on the stone before grouting prevented the top layer from being dislodged. When the wire was removed the concrete was tamped by hand, excess water was removed by brooming, and the surface was floated and finished by scratching transversely with a row of stiff wire mounted on a long handle.

IMPORTANT

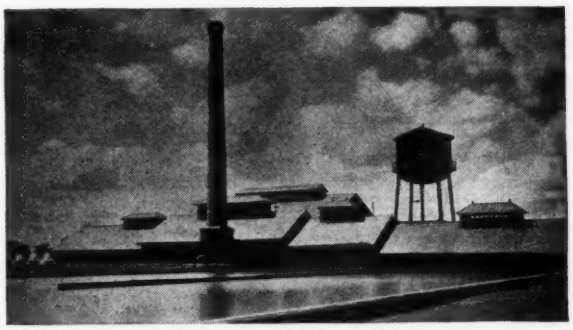
Public Health must be maintained!

The necessity of maintaining public health in war time is self-evident. Municipal officers in charge of water purification and sewage disposal have a vital responsibility in guarding the nation's health which should not be underestimated as a contributing factor to final victory.

However, the problems of maintaining public health are *becoming increasingly difficult in the face of material shortages and transportation handicaps.* General's "Alum" will help do the job right. But to ease the situation in regard to *Aluminum Sulfate* as much as possible, won't you place your orders as far ahead as you can so that we may schedule our production on an efficient basis.

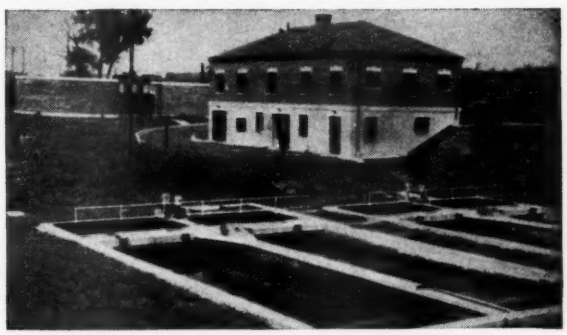
Why Most American Cities Prefer General Chemical Aluminum Sulfate

General Chemical Aluminum Sulfate is an especially developed "Alum." High quality and constant uniformity have given it a *time-tested* reputation among water works engineers and sewage plant operators, who know its reliability through experience.



★ FOR WATER WORKS

1. Makes water crystal clear.
2. Longer filter runs are obtainable.
3. Is economical, used properly will conserve chlorine supplies . . . because it does not require oxidation to make it effective.
4. Superior in tests against other coagulants.
5. High in quality, its constant uniformity can be counted upon.



★ FOR SEWAGE PLANTS

1. Clean, easy to handle and economical to use.
2. Simple application, requires only low cost feeding apparatus and minimum attention.
3. Clear, colorless effluents are possible.
4. Precipitated sludge digests readily.
5. Treated digested sludge dries quickly, without odor.

GENERAL CHEMICAL COMPANY

GENERAL CHEMICAL COMPANY

40 RECTOR STREET, NEW YORK 6, N. Y.

Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) • Buffalo • Charlotte (N.C.) Chicago • Cleveland • Denver • Detroit • Houston • Kansas City • Milwaukee • Minneapolis New York • Philadelphia • Pittsburgh • Providence (R. I.) • St. Louis • Utica (N. Y.)

Pacific Coast Technical Service Offices:
Los Angeles • San Francisco • Seattle, Wenatchee and Yakima (Wash.)

In Canada: The Nichols Chemical Co., Ltd. • Montreal • Toronto • Vancouver

When writing, we will appreciate your mentioning **PUBLIC WORKS**

Treatment of Icy Pavements

Practice recommended by the Highway Research Board in a bulletin just issued. Selection of materials and methods of applying them.

FOR prevention of skidding on icy pavements, the application of abrasive material, either alone or in combination with calcium or sodium chloride, is the most common method of treatment. In some cases sodium or calcium chloride is applied without abrasives. The pavement should be treated whenever slippery conditions exist and for as long a period as necessary. On primary roads all grades, curves, intersections and other danger points should be treated immediately after icy conditions develop. If labor, equipment and material are available it is advisable to treat the entire lengths of the more important primary roads. If the abrasives whip off, the road should be re-treated as often and for as long as the slippery conditions exist. The attempt should be made to avoid decreasing the service given the public on the primary roads. Adequate treatment of icy pavements is sound economy.

Calcium chloride spreader attached to rear of truck, on a Minnesota road.

On secondary and tertiary roads the amount of ice treatment to be undertaken depends upon the importance of the route, the geographic location and the type of traffic. On secondary routes it is advisable to apply abrasives on steep grades, sharp curves and other danger points. On roads where traffic is light it may be possible to use untreated abrasives. Ice treatment of tertiary and other less important roads is a local problem and should be handled according to the needs of existing conditions.

Materials

Calcium Chloride. Calcium chloride should conform to the requirements of the American Society for Testing Material Standard Specifications for Calcium Chloride, Designation D 98.

Sodium Chloride. Sodium chloride should conform to the requirements of the American Society for Testing Materials Tentative Specifications for Sodium Chloride, Designation D 632.

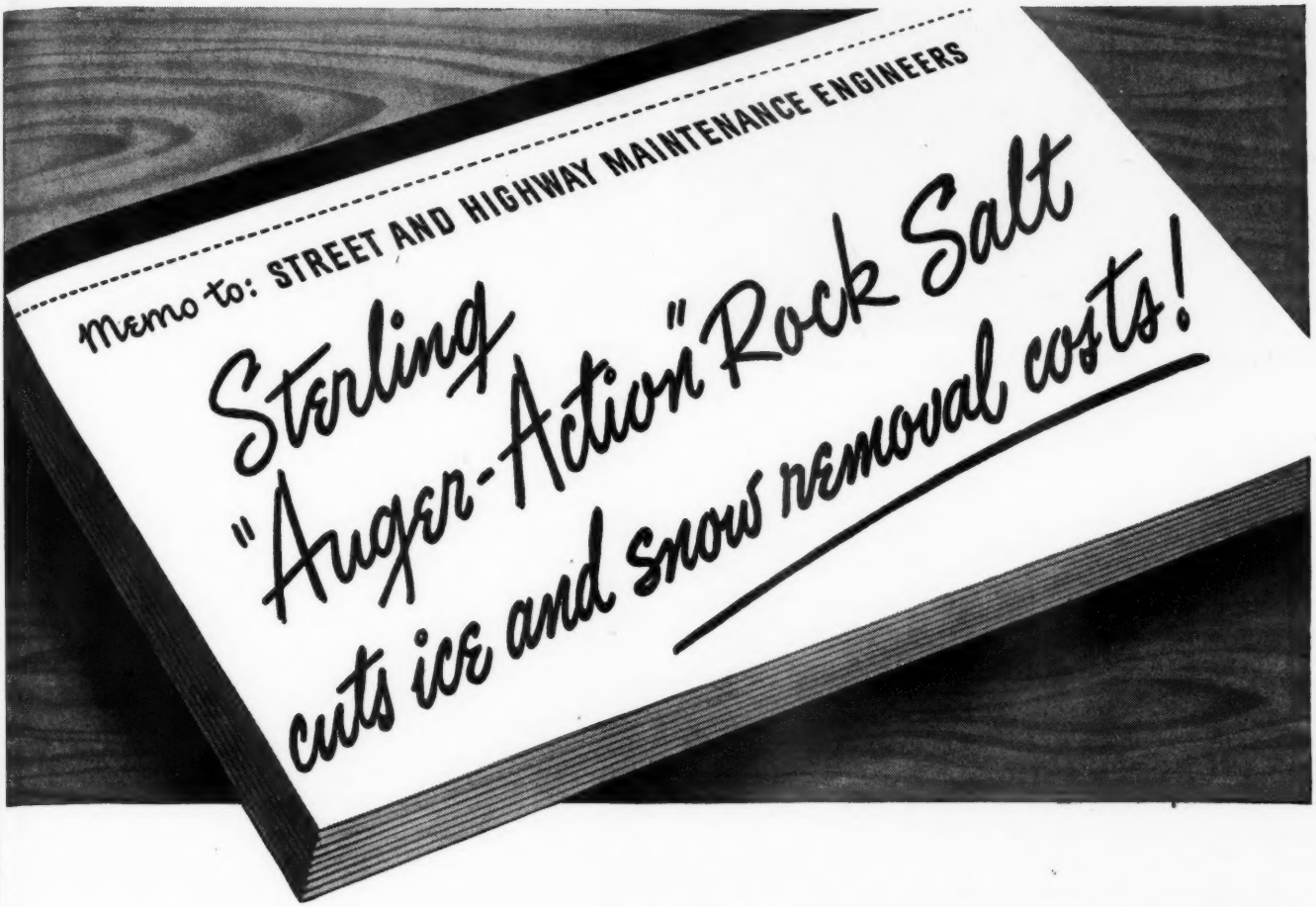
Abrasives. Local availability and unit cost determine the type of abrasive to be used. The cost of labor and equipment for storing and applying abrasives is several times that of the material itself. Thus a small initial saving in material cost might be more than offset by the necessity for larger quantities of abrasives per square yard or more frequent applications.

Sand: Sand containing an excess of fines does not provide good traction, and coarse material is likely to whip off and is therefore not effective in combating the skid hazard. Sand for ice control should be clean, hard, sharp, and free from loam, clay, or frozen lumps, with 100 per cent passing a $\frac{3}{8}$-in. sieve, not less than 45 per cent passing a No. 16 sieve, and not more than 30 per cent passing a No. 50 sieve. This sand will provide good traction and will have very little grinding effect on the road surface.

Cinders: Cinders are sharper than sand and cling to tires and cut into ice better than sand particles. The melting or embedding action of cinders with their greater porosity is better than that of sand because of the larger quantity of moisture and chloride held at or near the surface of the cinder particles. Due to their dark color, cinders absorb more heat than sand when the sun is shining, which results in greater embedment. Also, cinders have less tendency to clog drainage structures.

Washed Stone Screenings: Stone screenings from which the fines have been removed by washing produce a good abrasive; 100 per cent should pass the $\frac{3}{8}$-in. sieve, with not less than 45 per cent passing a No. 16 sieve and not more than 30 per cent passing a No. 50 sieve.

A city street from which snow and ice have been removed by means of salt.



ALERT OFFICIALS of states, counties and cities throughout the nation's ice, snow and sleet belt are finding out for themselves how Sterling "Auger-Action" Rock Salt cuts winter maintenance budgets. Highway Departments report savings of from one-third to one-half with "Auger-Action" Rock Salt. These same departments find, too, that roads and streets are cleared far more quickly with rock salt than with any other method of ice removal.

Here's how—

Sterling "Auger-Action" Rock Salt, applied early in a storm, prevents snow from packing and bonding to the pavement—makes complete removal with scraper or plow fast and easy.

Sterling "Auger-Action" Rock Salt, used straight without abrasives, effectively treats five times as much street surface as other ice control materials, thereby saving time-consuming hauls from supply points. One crew, one piece of spreading equipment, does the work of five using old-fashioned methods.

There is no better winter than *this* winter to prove to your own satisfaction what "Auger-Action" Rock Salt can do for you in your own area. Put it to every test to confirm the experience of satisfied users.

HERE'S HOW "*Auger-Action*" WORKS

When ice has once formed, Sterling "Auger-Action" Rock Salt pellets act first as an abrasive on the surface of the ice or compacted snow—roughening and channeling it. Then they bore clear through to the pavement beneath—honeycombing the ice or packed snow. The brine produced by the rock salt's fast melting action spreads out on the pavement surface—undercutting the bond between the pavement and the snow or ice sheet.

Thus loosened and further broken up by passing traffic, complete removal by scraper or plow is fast and easy—giving a bare, safe-driving surface.

Let Our Engineers Help Solve Your Ice and Snow Removal Problems

International Field Engineers are available for free consultation on every ice and snow removal problem. Bulletin with full details on the use of "Auger-Action" Rock Salt for snow and ice control is yours for the asking. Address International Salt Co., Inc., Dept. PW-12, Scranton 5, Pennsylvania.

STERLING "*Auger-Action*" ROCK SALT

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 67-69*

Stockpile of calcium chloride-treated abrasives, sealed with a light bituminous treatment.

The percentage of wear of crushed rock from which screenings for abrasives are prepared should not be more than 45 per cent as determined by the Standard Method of Test for Abrasion of Coarse Aggregate by the Use of the Los Angeles Machine (American Association of State Highway Officials T96-42; American Society for Testing Materials C131-39).

Treatment of Abrasives

Abrasives should be treated to prevent freezing before application and as an aid to embedding the material in the ice or packed snow so that it will not be blown off the road. Heating the abrasives does not work out well in practice. Treatment with sodium or calcium chloride is the best method of preparing abrasives for treating icy pavements.

When abrasives are placed in storage they should be treated with from 40 to 75 lbs. of chloride per cubic yard, depending on the moisture content of the abrasive and the temperature. For sand and stone screenings containing not more than 4 per cent of moisture, 40 lb. is recommended; for sand and stone screenings with moisture contents greater than 4 per cent and for all cinder abrasives, 75 lb. is recommended. The protection provided by these amounts of calcium or sodium chloride will assure unfrozen material down to zero temperature for even a combination of cinder abrasives with 15 per cent moisture.

The chloride should be well mixed with the abrasive by some practical method at nominal cost. The chloride may be ribboned in with the abrasive as it is being loaded into bins, or it may be spread over each load as it is discharged into stockpiles. The chloride will gradually dissolve and disperse in the moisture present in the abrasive.

When the trucks are being loaded for distribution of the abrasive on the road, additional chloride may be added. This additional treatment (usually 25 to 50 lb. per cu. yd.) provides a reserve melting capacity which accelerates the embedment of the abrasive into the icy surface, thus minimizing loss due to traffic and wind. When abrasives are stored in covered water-tight bins, it is possible to use considerably less chloride, as loss from dilution and leaching is prevented. In such cases, if the chloride is uniformly distributed with the aggregate, it will not be necessary to add chloride when loading trucks from the material in storage.

Spray Method of Applying Chlorides

A convenient and efficient method of applying calcium chloride to the abrasive to obtain quick and uniform dispersal of the chemical is by spraying with brine. The brine is usually made up of 5 lb. of flake calcium chloride to 1 gal. of water. The resultant brine will contain 4 lb. of chloride per gallon, which is the eutectic or lowest freezing point solution.

A practical way to prepare such a solution is to fill a 50 gal. drum about two-thirds full of water (never add the calcium chloride first), then put in 200 lb. of dry flake calcium chloride, stir until it is dissolved and fill with water to the top.

The brine treatment provides a saturated unfrozen condition of the abrasive which considerably hastens the solution of any additional flake chloride required. The method is especially adapted to use with cinders or other high absorptive abrasives which may be received comparatively dry. The amount of chloride, applied in brine, which can be held by the abrasive without loss from drainage is controlled by the moisture content of the abrasive as received. The saturation point of average sand is about 18 gal. per cu. yd. The brine can be absorbed without loss of chloride until the total moisture and brine content reaches the saturation point.

With dry or damp sand or stone screenings it is generally possible to use about 8 gal. of brine per cubic yard of abrasive with a negligible loss of chloride. The operator, after a few initial tests and trials, learns to soak the abrasive without oversaturation. The brine is usually sprayed on the abrasive as it is being loaded into bins or into covered stockpiles. Eight gallons of brine introduces about 32 lb. of chloride to 1 cu. yd. of abrasive. This amount is sufficient for pretreatment to prevent freezing in the bins and for use on the road at temperatures down to about 20° F. For lower temperatures it becomes necessary to add additional flake chloride as given in Table 1.

TABLE 1.—(BASED ON TOTAL ABSORPTION OF 18 GAL. PER CU. YD.)

A	B	C	D	E
6	24	16	26	36
8	32	8	18	28
10	40	0	10	20
12	48	0	2	12

A—gallons of brine used per cubic yard of abrasive.
B—pounds of chloride per cubic yard of abrasive introduced.
C—pounds of flake chloride per cu. yd. in addition to Column B required for +10°F.
D—pounds of flake chloride per cu. yd. in addition to Column B required for —5°F.
E—pounds of flake chloride per cu. yd. in addition to Column B required for —20°F.

With dry or damp cinders it is necessary on account of the greater absorption to use 15 to 20 gal. of the brine per cubic yard of abrasive.

If the sand, stone screenings or cinders are more than damp, the brine spray method is not recommended. However, if its use is necessary with wet sand or screenings, add only enough brine to assure saturation and then supplement this with dry flake calcium chloride. For example, if the brine application only provides 25 lb. of calcium chloride per cubic yard of abrasive, whereas for —5°F. a total of 50 lb. is required, it will be necessary to make up the deficiency by adding 26 lb. additional flake calcium chloride per cubic yard. The operator after a few tests and trials learns to soak the abrasive without over-saturation and loss of chloride from drainage.

Sodium chloride may be used in the form of a brine spray as described for calcium chloride, except that it is not recommended for use in climates or during seasons when temperatures below zero Fahrenheit might be encountered.

Storage of Abrasives

Bins. The best method of storing abrasives is in bins so located that they will serve more than one road if possible. A bin to be used efficiently should

Lift the Heavy Hand of Taxes!

Reduce or eliminate municipal taxes...make your city more attractive to residents, merchants, and industries...by installing a Fairbanks-Morse Diesel Light and Power Plant.

While providing current at normal rates, the earnings of these plants are available to pay much, and sometimes all, of a city's expenses.

Plan now to give your city this great advantage. Write today for detailed information. Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

BUY WAR BONDS—SPEED V-DAY

Fairbanks-Morse

A name worth remembering

Diesel Locomotives • Diesel Engines • Generators • Motors • Pumps • Scales
Magnetos • Stokers • Railroad Motor Cars and Standpipes • Farm Equipment

When writing, we will appreciate your mentioning **PUBLIC WORKS**

be accessible at two elevations, one at an upper level so that trucks can discharge into the bin, and the other on a lower level so that trucks can be loaded directly by gravity. The capacity should be 50 to 100 cu. yd., depending on the needs of the roads to be served.

Sheds. When storage is required at a location which does not have the necessary difference in elevation for a bin, a shed gives the next best protection for treated abrasives. A shed should have a capacity of at least 100 cu. yd. and so built that the walls will support the load of the sand piled against them. It should be enclosed on three sides and roofed. A belt or bucket-type loader should be provided.

Stockpiles. Where it is not possible to have either a bin or shed, the abrasives should be placed in a stockpile. Such a pile should have a triangular cross section about 6 ft. high and 14 ft. wide at the base. It is desirable to cover these piles with waterproof paper. However, as such paper is practically unobtainable during the war, use will have to be made of any substitutes that may be available. The degree of protection will depend upon the water tightness of the cover. Since abrasives practically always contain moisture, they will freeze if exposed to the weather. Treatment with chloride will prevent freezing for a period, but the chemical will leach out in time if not in water-tight storage and the outer crust, if not the whole pile, will freeze. This effect can be minimized by spreading dry chloride over the top of the stockpile.

Loading and Application of Abrasives

Speed is the essential factor in successful treatment of icy pavements. Every effort must be made to load, haul, and apply the abrasives as quickly as possible. Loading points should be so located that the trucks will spend the least possible time enroute. Hand loading ties up the trucks when they should be out on the road. Loading from bins is the preferable method, with the use of a shed and loader combination as next best. If it is impossible to use mechanical loading entirely, the trucks should be so distributed that only small trucks will be hand loaded.

When abrasives are stored at commercial plants and loaded with the plant equipment, the facilities must be provided on a 24-hr. basis.

Application of Abrasives

Before treating a road surface with abrasives or chemicals to prevent skidding on icy surfaces, the snow or loose ice should be removed as completely as possible. Plowing with snow plows or blade graders is the usual practice.

An effective method of preparing the surface is by scoring the ice or packed snow with a saw-tooth blade. The purpose is not to remove the ice but to roughen it in preparation for treatment with abrasives or chemicals. The loosened ice or snow should be removed as soon as possible with conventional plowing blades.

An application of ½ lb. to 1 lb. of treated sand or cinders per square yard will give a good cover and should make the road non-skid if it is uniformly distributed. When traffic or wind has whipped off the material, it may be necessary to re-cover some sections, especially on grades, curves and intersections.

Equipment. A conventional three to five-ton truck with a mechanical spreader is the most desirable equipment for ice treatment. However, any type of truck with a dump body can be used, including four-wheel-drive plowing units. Spreaders should be installed on each piece of snow removal equipment that is equipped with a dump body.

Speed of discharge and uniformity in distribution are the important functions of a satisfactory spreader. There are two general types of spreader; one is attached to the truck and the other is on a trailer. Power may be obtained from a belt-driven by the rear wheels of the truck, from a separate motor, or from a wheel attached to the spreader and driven by contact with the road surface.

One efficient spreader consists of a 6-cu. yd. trough-shaped hopper in place of the conventional truck body. The abrasive material is fed uniformly to the spreading mechanism by means of a screw conveyor. The control mechanism of this unit is in the cab and it is unnecessary to have a man riding on the body of the truck. This unit is operated by a separate gasoline motor.

Ample illumination of equipment should be furnished for safety at night. A distinctive group of cluster lights should be placed on all sanding and snow removal equipment. Reflectors should be provided on the rear of the cab, the rear of the body, and if necessary, on the spreader. Removable hand rails should be provided for the sides of the body to protect the men. Lanterns or other warning lights should be hung from the tailgate. A flashing red light with a ten-inch lens mounted on a telescopic bracket and attached to the left rear of the cab should be standard equipment on all plowing and sanding units.

Application Of Chloride Without Abrasive

Another method of ice control now being tried is the application of dry chloride directly to the road surface. There is often a period immediately following a snowstorm when the temperature is at its highest level before falling. During this period there is a considerable amount of moisture both in the air and on the road surface. At this time application of from 300 to 500 lb. of sodium or calcium chloride per mile of two-lane roadway spread for about two feet along the center line will form a solution which will prevent the formation of ice. Under severe conditions it might be advisable to use chloride up to 0.5 lb. per sq. yd. distributed over the entire roadway width.

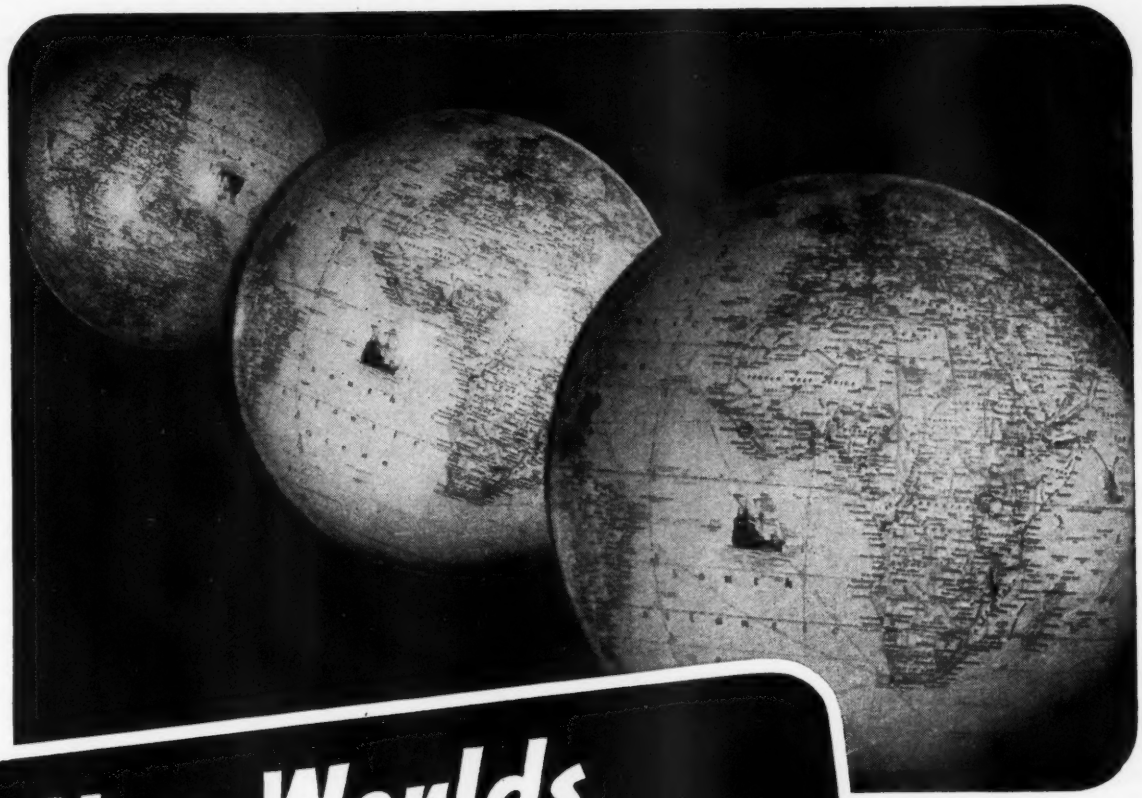
The chloride can be applied through the regular spreader if the truck travels fast enough and the discs are detached. It also can be spread directly through the tailgate. A special dispenser can be made using a funnel-shaped metal hopper at the elevation of the back of the truck with a 2-in. iron pipe running to a flared plate set about 9 in. from the road surface.

This method is particularly adaptable during sleet or light snow storms which occur when the temperature is just below freezing and continues thus for some time.

Treatment Of Portland Cement Concrete

Calcium or sodium chloride-treated abrasives, or these chlorides used alone, should be applied as sparingly as possible to portland cement concrete pavements. This is because repeated freezings and thawings of concrete in contact with these salts may be conducive to surface pitting or scaling.

Unscaled pavements over 4 years old, those that have been given protective surface treatments, those made from portland cement containing air entraining agents or those into which air entraining agents were introduced at the mixer, are relatively free from this danger.



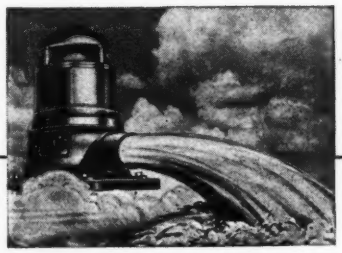
New Worlds TO CONQUER IN 1945

Look out for suddenly issued orders that may quickly end much war goods manufacturing. Look for swift changes to many urgently demand peace-time products. Whenever, or whatever these changes may be, water in abundance will still be an absolute necessity.

Now is the time to check your needs for a thoroughly modern, quality built and ever dependable Layne Well Water System. You will want the best that money can buy; a water system that will last the longest, take less in up keep cost and operate at a new low in economy.

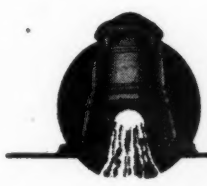
Layne Pumps and Well Water Systems have a reputation that extends around the world. They are more widely used than any other make on the face of the globe. They are serving more cities and industries than all other makes combined. As a pioneer in both well installation and pump building, Layne has created, proven and uses exclusively the greatest number of major efficiency features.

Be prepared for the changes of 1945! Get the facts about Layne Pumps and Well Water Systems now. For new literature, or the counsel of an experienced Layne engineer, address, Layne & Bowler, Inc., General Offices, Memphis, Tennessee.



LAYNE AFFILIATED COMPANIES ARE SO SITUATED AS TO PROVIDE NATION-WIDE SERVICE

Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La. * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City and Pittsburgh, Pa. Wis. * Layne-Ohio Co. Columbus, Ohio * Layne-Texas Co., Houston and Dallas, Texas * Layne-Western Co., Kansas City, Mo., Chicago, Ill., and Omaha, Neb. * Layne-Western Co., of Minnesota, Minneapolis, Minn. * International Water Supply, Ltd., London, Ontario, Canada.



LAYNE

WELL WATER SYSTEMS

DEEP WELL PUMPS

FOR CITIES, INDUSTRIAL PLANTS, RAILROADS, MINES, AIR CONDITIONING, IRRIGATION PROJECTS

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 67-69*

How Henderson Maintained an Adequate Water Supply

Siphoning over dam made available the water in the bottom of the reservoir. Borrowed pumps, prisoner labor and emergency pipe did the rest.

By HENRY T. POWELL
Mayor of Henderson, N. C.

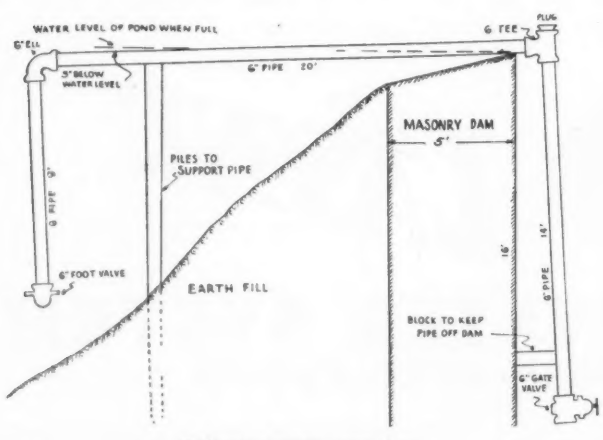
THE Henderson Water Works, which is owned by the City of Henderson, N. C., takes the water which it supplies to its customers from an impounding reservoir fed by three small creeks. These creeks in normal times deliver 600,000 gallons of water per day. The industrial and domestic consumption of water in Henderson is more than 1,000,000 gallons per day, and the difference between the normal creek supply and the consumption is made up by water from rains falling on the water shed and stored in the impounding reservoir, which holds 120,000,000 gallons of water.

Below the impounding reservoir is a smaller reservoir, which was built to catch the flow of another small creek, and from which water is pumped to the filter plant. When the level of this lower reservoir falls, water is supplied to it by opening a 10″ gate valve in the impounding reservoir until the small reservoir is again full.

Unfortunately, when the gate valve was installed in the main impounding reservoir it was located so high that the last 30,000,000 gallons of water is below it and consequently will not flow out of the reservoir by gravity. The dam of the impounding reservoir has been raised from time to time to increase the storage until it is not possible to raise it further.

We are today serving 1952 customers, many of which are industrial users. This is an increase of 645 customers in six years; and because of the large number of industrial plants located here doing war work, many of the old customers have more than doubled their normal consumption.

It was clearly seen that, with 400,000 gallons of water a day being used more than was normally replaced by our creeks, we were in a dangerous position, especially since the evaporation on extremely hot days caused an additional loss of at least a half-million gallons a day. In fact we were able to avoid a serious water shortage in 1942 only because of an abundant rainfall at the necessary times.



Siphoning water over dam.

But 1943 was the driest year on record here; after the first of May there were only two rains sufficient to lay the dust until the 26th day of December. The level of the impounding reservoir fell so that by the end of August we had drawn all of the water from the reservoir which would flow out by gravity and it became necessary to utilize in some way the 30,000,000 gallons remaining. This was done by means of two siphons made from galvanized steel pipe, one 6″ and one 4″. Except for the size of the pipe, the construction of these siphons was identical. We used a 20-foot length of pipe with one end supported on the dam and the other end on piles driven inside the reservoir. An ordinary ell was placed on the latter end, from which a 9-foot length of galvanized pipe dropped vertically into the water. A foot valve was screwed on the lower end of this to hold the water in the pipe when the siphon was not in use. At the other end and about a foot from the front of the dam a vertical 14-foot length of pipe was connected to the 20-foot length by means of an ordinary tee set vertical with the upper end plugged air tight. At the bottom of this pipe an ordinary Ludlow 6″ gate valve was used.

To prime the siphon, the plug was removed from the top of the tee and water poured into the pipe until it was full, and the plug was replaced and made air tight. Then the gate valve was quickly opened and water began to flow through the siphon. The gate valve and foot valve were in perfect condition and did not leak, and thus the water remained in the pipe from the end of one siphoning period until the beginning of the next and thus it had to be primed only once. By this means we were able to siphon about 600 gpm through the 6″ pipe and 200 gpm through the 4″ pipe.

Due to the extremely dry weather the streams, which normally supplied 600,000 gallons of water a day, were only supplying about 400,000 gallons a day, and the evaporation due to the unusually high temperatures was very rapid. An ordinance was passed prohibiting the use of water for all but necessary purposes; but although our customers co-operated with us almost 100%, our supply continued to drop at an alarming rate.

Having foreseen the danger, the city had, earlier in the year, purchased another pond covering 96 acres fed by different creeks and having a storage capacity of some 250,000,000 gallons, to be developed after the war. This pond was located approximately three-fourths of a mile below our present impounding reservoir and made available to us an additional supply if we could find some way to get it back to the impounding reservoir. We had an old Lea-Courtney pump which had been purchased about twenty-five years ago and which was rated at 50 gpm against 200 ft. head, but we did not have the pipe on hand for the line.

Permission was requested from the WPB to purchase 6,000 feet of 6″ bell and spigot, Class 150, cast

(Continued on page 38)

AHEAD WITH DRESSER

DRESSER INDUSTRIES now number ten.

Formerly, we were seven companies helping to bring basic services to the user more efficiently.

Our three new partners, each a specialist in its fields, both round out and broaden Dresser's scope of usefulness. This larger Dresser group can now serve industry and consumers with more products and greater experience.

The new Dresser members are bulwarked by an organization that assures their customers continued progress in product improvement, greater wherewithal for pioneering research and steady maintenance of service.

Dresser Industries, Inc., has progressed through the management principle of giving to alert, independent know-how an adequate backing and pooled resources. From these, each member draws teamed strength far greater than it could enjoy alone. The three new members of Dresser Industries, Inc., increase opportunities for mutual aid among the teammates, and at the same time, draw from the group advantages for those they serve.

MEMBER COMPANIES

Dresser Manufacturing Division, Bradford, Pa.
The Bryant Heater Co., Cleveland, Ohio
Clark Bros. Co., Inc., Olean, N. Y.
Pacific Pumps, Inc., Huntington Park, Calif.
Bovaird & Seyfang Mfg. Co., Bradford, Pa.
Dresser Mfg. Co., Ltd., Toronto, Ont.
Van der Horst Corp. of America, Olean, N. Y. Cleveland, Ohio

PLUS

*International Derrick & Equipment Co., Columbus and Marietta, Ohio, Torrance, Calif. Beaumont, Texas
*Roots-Connersville Blower Corp., Connersville, Ind.
*Stacey Bros. Gas. Construction Co., Cincinnati, Ohio

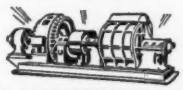
DRESSER Pipe couplings and repair devices for pipeline systems. Rings and forgings.

BRYANT Gas-fired boilers, winter air conditioners, furnaces, unit heaters and conversion burners for residential, commercial and industrial heating.

CLARK Engines and compressors for oil production and refining. Marine and stationary Diesel engines.

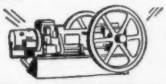
PACIFIC Hot-oil charging pumps; boiler-feed pumps; general-service pumps for the petroleum and other industries; oilwell plunger pumps; deep-well turbine pumps.

INTERNATIONAL DERRICK Oil-well pumping units, derricks and masts, drawworks, rotary tables and drilling units. Airport, communications and electric-power-line equipment and prefabricated steel buildings.



ROOTS-CONNERSVILLE Positive displacement and centrifugal blowers, exhausters, boosters and compressors. Air and liquid pumps and meters.

STACEY BROS. Storage holders, tanks and pressure vessels for the gas, oil, chemical and food industries.

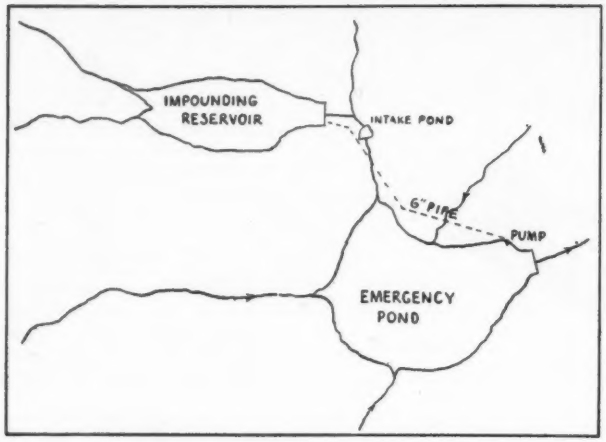


BOVAIRD & SEYFANG Pumping engines, jacks, "powers", storage tanks and allied supplies and equipment for oilfields.

VAN DER HORST PORUS-KROME—a patented process of applying chromium lining on cylinder walls, piston rings and crankshafts—for longer wear.

DRESSER INDUSTRIES
INCORPORATED

When writing, we will appreciate your mentioning **PUBLIC WORKS**



Sketch plan of sources of supply.

iron pipe, and after several delays we were given authority to purchase this pipe on October 20, 1943. The same morning at 11 A.M. order for the pipe was placed with the Glamorgan Pipe & Foundry Company of Lynchburg Virginia, over the telephone, and they immediately loaded one car and delivered the same to the C & O Railroad at Lynchburg in time to be carried out by a three o'clock freight for Richmond that afternoon. And with the co-operation of the Seaboard Air Line Railway the first car was delivered to us within thirty-six hours of the time the order was placed, and the other two cars were delivered within forty hours later.

However, getting the pipe was only one half of our problem; the other half of the problem being to get it installed. This involved cutting a right-of-way and building a road through woods and dense undergrowth, a large part of which was inaccessible by road. Our regular repair and maintenance crew of four men could not possibly complete this job within the time allowed, and unemployed labor could not be found; but by checking our records of former employees who had worked for us either directly or on WPA projects we found eight men now employed by other concerns who were experienced in caulking, whose employers, when approached and the situation explained to them, loaned these eight men to us for two weeks.

But we still had no common labor to clear the right-of-way and build the road and lay out the pipe. We contacted the division engineer for the North Carolina State Highway and Public Works Commission and he arranged for us to hire thirty prisoners for a period of one week. During this week these prisoners cut the right-of-way, built the road, and placed the pipe. As we did not have sufficient labor or time to bury the pipe in the ground, we laid it on the surface. To avoid freezing in the winter, we tapped the line at all low places and put in drain cocks so that the line could be drained during the winter when not in use.

Thirteen days after the first pipe was received here the right-of-way had been cut, the road built, the line laid and caulked, a temporary house for the pump built, and we were ready to begin pumping with the Lea-Courtney pump. But on starting up this pump we found that it would deliver only about 100 gpm, and further investigation showed it to be worn beyond repair. We were able to borrow from the Raleigh Granite Company two Rex pumps, each rated at 500 gpm against a 90 foot head, and by using these pumps in series we were able to deliver 300 gpm. While this was not sufficient for our needs it was a big help, particularly when we were visited with a $400,000 fire. Fortunately our supply held out during the fire and for two days thereafter, and then we had our first real rain in five months, and about 15,000,000 gallons was added to the scanty supply in our impounding reservoir. However, the same rain flooded the pits of the Raleigh Granite Company and of course they had to have their pumps back to keep their quarry in operation, which left us with only the old Lea-Courtney pump, which could pump only a negligible amount of water.

Early in December the temperature fell overnight to around the zero mark and our siphons which carried the water over the dam, which had been cut off the night before to avoid wasting water, froze solid, and for 12 hours we were unable to get a single drop of water through them. But they were thawed out by our crew just before our reserve supply of 750,000 gallons of water was exhausted. Meantime the pond and creeks froze over to a depth of 6″ or more and for ten days not a drop of water flowed into the impounding reservoir; and when the ice on the reservoir melted on December 20th less than one week's reserve of water remained in it. The Raleigh Granite Company could not loan us the Rex pumps again, and we found ourselves with only the old pump, which was hopelessly inadequate for our needs. Every attempt to rent or buy a pump at once had been exhausted. But the City of Greensboro and the City of Durham offered to loan us three 500 gpm skid-mounted fire pumps, which had been loaned them by the OCD, provided we could get the proper approval. The WPB and the OCD were contacted by telephone and red tape was cut and permission to borrow these pumps was promptly granted on December 23rd.

We sent after the pumps early on the morning of December 24th and worked on through Christmas Day, altering the pipe line and connections to receive the three pumps, and by noon on Christmas Day 500 gpm and more was being pumped through the line and the danger of a water famine at that time was passed. The next day abundant rains fell and soon the impounding reservoir contained 120,000,000 gallons of water.

But we realized that while the danger had passed for the time being it would sooner or later return, and steps were taken to provide against such a recurrence. The WPB granted us permission to purchase a 50 gpm centrifugal pump powered by a diesel engine, and bids were taken and the contract awarded to the DeLaval Steam Turbine Company, which agreed to deliver a centrifugal pump, powered by a 46.3 bhp Hercules Diesel engine, which would deliver not less than 500 gpm against a 240 foot head. Delivery on this unit is expected in the early fall; and until it is received the OCD has granted us permission to retain two of the borrowed fire pumps to care for any emergency which may arise until the new pump and motor are received and installed.

Since we have had an abundance of rainfall this summer and there is no prospect of a water shortage at this time, our pump should be received and installed in ample time to provide against any future emergency which may arise.

We plan to leave the 6″ line on top of the ground until after the war, and then take it up and use it in other parts of the distribution system, burying an 8″ cast iron line, and changing the impellers in our pump to deliver additional water to the present impounding reservoir to provide for future expansion.

Back again!

BRONZE CASES

for

Worthington-Gamon Meters

...but Present Government Regulations Limit Use to Small Meters

WAR Production Board Limitation Order L-154 has been amended to permit the allocation of a limited amount of copper to the manufacture of bronze cases for water meters. Bronze will be used for Worthington-Gamon meter cases in ⅝" to 1" sizes only.

"Watch Dog" Quality Based on Longest Experience, Largest Research Facilities

The oldest water meter manufacturer, Worthington has constantly improved its broad line, to minimize maintenance, and at the same time measure ever smaller quantities dependably, accurately.

The Most Extensive Nation-Wide Service

Another reason why Worthington-Gamon Meters have been specified in the largest U. S. contracts: 24 district offices in 24 leading cities.

WORTHINGTON-GAMON METER COMPANY

282-296 South Street, Newark, New Jersey

WG4-6

Subsidiary of

WORTHINGTON PUMP AND MACHINERY CORPORATION

Power Plant Equipment • Turbines & Turbine-Generator Sets • Condensers, Heaters, Ejectors • Water Purification Equipment • Pumps, Stationary and Portable Compressors • Air Conditioning & Refrigerating Equipment • Power Transmission Equipment • Construction Machinery, Equipment for Mines • Locomotive Feedwater Heaters • Welding Positioning Equipment • Liquid Meters

WATCH DOG

WATER METERS

The Meter Specified in the Largest Contracts Ever Awarded in the U. S.

"Watch Dog" models . . . made in standard capacities from 20 GPM up; frostproof or split case in household sizes. All parts interchangeable with your present meters of our manufacture. Write for Bulletin.

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 67-69*

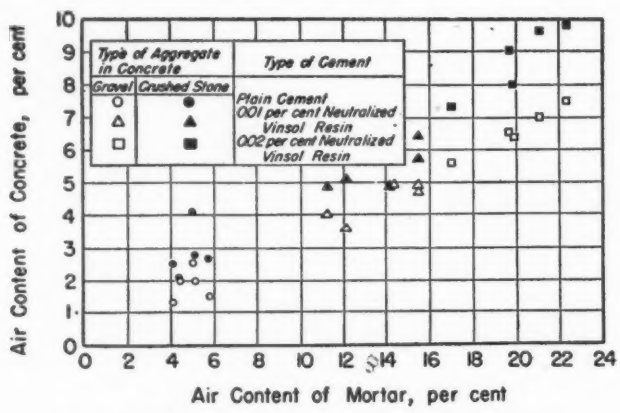
Use of Vinsol Resin in Air-Entraining Cements

Laboratory tests to determine how to control the amount of air entrainment, and practical tests on transit-mixed concrete.

IN 1939 the Central Concrete Laboratory, Corps of Engineers, U. S. Army, undertook an extensive investigation of cement durability. Of the 52 cements included in this program, six exhibited outstanding superior durability and all six were found to contain air-entraining agents. This discovery led, in 1941, to the specifying of Vinsol resin-treated portland cement for use on certain projects constructed by the Corps of Engineers. (See PUBLIC WORKS for July 1944, "Air-Entraining Properties of Cement.") Up to the present time this laboratory has tested in excess of 1,800,000 bbl. of Vinsol resin cement for use in military construction. In general, this material, as controlled by the requirements of Federal or A.S.T.M. Specifications (see PUBLIC WORKS for August 1944—"Specifications for Air-Entraining Cement"), has been found to be satisfactory and its use has resulted in concrete of superior durability. In a few instances, however, cements conforming to the specifications have entrained excessive amounts of air in concrete.

Evidence from field construction indicated that the air content of concrete made with portland cement containing Vinsol resin was not closely predictable from the amount of Vinsol resin present in the cement as specified in A.S.T.M. Specifications C 175. In order to determine means by which the air entrainment could be made regulable to a reasonable degree, it was necessary first to learn the nature of the reaction between Vinsol resin and portland cement, and an investigation of this has been made by the Laboratory. The results were reported in a paper by Charles E. Wuerpel and Albert Weimer, engineer in charge and chief engineer, respectively, of the Laboratory, before the recent annual meeting of the American Society for Testing Materials.

The 106 cements included in the first phase of this study, representing the product of 19 mills, contained flake Vinsol resin interground at the mill. Chemical analysis revealed a range of 0.019 to 0.069 per cent Vinsol resin by weight of the cement.


Type of Aggregate in Concrete
Gravel
Crushed Stone
Type of Cement
Plain Cement
.001 per cent Neutralized Vinsol Resin
.002 per cent Neutralized Vinsol Resin
Air Content of Concrete, per cent
Air Content of Mortar, per cent
0 2 4 6 8 10 12 14 16 18 20 22 24
0 1 2 3 4 5 6 7 8 9 10

Relation of air content of mortar to air content of concrete.

Since it was found that about 2½ times more air was entrained by Vinsol resin-treated cement in mortar than in concrete, it was decided to use mortars for these tests. The air content was computed from the reduction in volume when a known volume of mortar was subjected to a pressure of 20 mm. of mercury. Alkalinity, Vinsol resin in solution, and alkali in solution were determined chemically on an aqueous extract, which was obtained by filtering a portion of the mortar under reduced pressure.

In every case, more than eight times as much alkali (NaOH) was present in the extract as was needed to neutralize all the Vinsol resin in the cement. Since only a portion of the Vinsol resin in the cement appeared in the extract, some factor was considered to have inhibited the solution of the rest of the Vinsol resin.

The indication that the variation of air content was caused by the variable amount of Vinsol resin *going into solution,* suggested an investigation of the possibility of adding *neutralized* Vinsol resin to the cement. Accordingly mortars were made with nine untreated cements, in the preparation of which amounts of the sodium salt of Vinsol resin, equivalent to 0.01 per cent Vinsol resin by weight of the cement, were added to the mixing water. Tests of air content similar to those referred to above were conducted on these mortars and on mortars made from the same cements to which no resinate was added. These tests indicated that the use of neutralized Vinsol resin affords definite advantages over unneutralized in control of air entrainment.

There is some evidence to support the belief that the particle-size distribution of the cement influences the air entrainment and, since this property might vary from grind to grind as well as from mill to mill, some lack of certainty in the air entrainment probably is inevitable. It is, therefore, not possible to obtain absolute control of the air content simply by means of a quantitative control of the air-entraining agent. Nevertheless, if the variability of air content can be reduced by the use of neutralized Vinsol resin to about one-quarter of that when unneutralized Vinsol resin is used, the neutralized resin is seen to have distinct advantages.

A reasonably close relationship exists between the air entrained in the test mortar and that entrained in the concrete, although the variation in air content is materially less in concrete than in the test mortar. This is shown by the illustration.

As a result of these tests the following conclusions were reached:

1. Cement containing interground flake Vinsol resin entrains an amount of air in mortar which is related *neither* to the Vinsol resin content of the cement, the alkalinity, nor the alkali content of the extract of the mortar.

2. The amount of air entrained in mortar is related

They're Going Overboard For Victory—Are YOU?

USE 8-POINT PLAN FOR AN OVERBOARD DRIVE IN THE 6th WAR LOAN!

NOV. 20th TO DEC. 16th

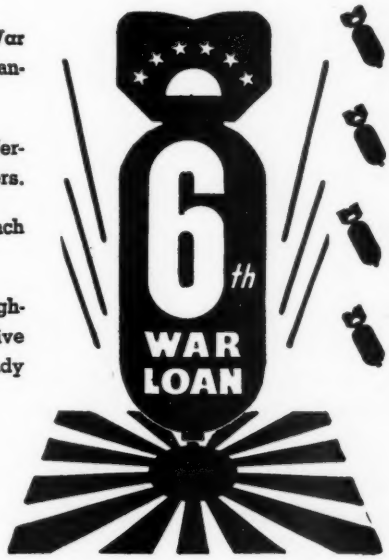
Our fighting men still have a long way to go! But—your plant-wide selling of the 6th can do much to shorten their embattled miles—lessen the price they so willingly pay for victory! Join the coast to coast parade of patriotic firms that are assuring an **"overboard" showing in the 6th** by following through on **every** point in the 8-Point Plan.

Start the ball rolling by appointing a **6th War Loan Bond Committee**, representing labor, management and other groups.

Carry on by selecting a **Team Captain**—preferably a returned veteran—for every 10 workers.

Right at the start, establish a Quota for each department—and every employee.

Arrange frequent Meetings of Captains, highlighting importance of their work—effective **sales methods**—and need for painstaking study of Treasury Booklet, Getting The Order.



Make definite Assignments to those best equipped to arrange music, speeches, rallies, competitive progress boards and meeting schedules.

Issue Individual Pledge Cards—made out in the name of each worker and providing for both cash and installment purchase.

Resolicit! This is the secret of "overboard" War Bond subscriptions. Your State Payroll Chairman has a special Resolicitation Plan for you to put into action near the end of the campaign.

Give generously of your **Advertising Space** to drive home the War Bond story.

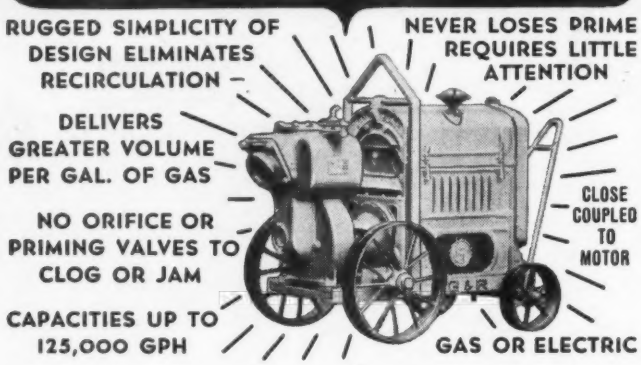
The Treasury Department acknowledges with appreciation the publication of this message by

PUBLIC WORKS Magazine

★ *This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council* ★

When you need special information—consult the classified READER'S SERVICE DEPT., pages 67-69

Streamlined Inside for Higher Efficiency and Lower Operating Costs


RUGGED SIMPLICITY OF DESIGN ELIMINATES RECIRCULATION
NEVER LOSES PRIME REQUIRES LITTLE ATTENTION
DELIVERS GREATER VOLUME PER GAL. OF GAS
CLOSE COUPLED TO MOTOR
NO ORIFICE OR PRIMING VALVES TO CLOG OR JAM
CAPACITIES UP TO 125,000 GPH
GAS OR ELECTRIC

Streamlined where it counts, you can't clog a Gorman-Rupp Self-Priming Pump. Unequaled in rugged efficiency, gallonage or continuous hours. A size and type for every need.

THE GORMAN-RUPP COMPANY, MANSFIELD, O

GORMAN-RUPP
SELF-PRIMING CENTRIFUGAL PUMPS

CUT MAINTENANCE COSTS 75%

Concrete slab maintenance costs can be reduced as much as 75% by the Koehring Mud-Jack Method. The Mud-Jack raises sunken concrete walks, curbs and gutters, driveways, streets, and airport runways eliminating reconstruction costs. Write for the new Mud-Jack Bulletin which is both illustrative and descriptive.

KOEHRING HEAVY DUTY

KOEHRING COMPANY
Milwaukee, Wisconsin

MUD-JACK METHOD

When writing, we will appreciate your mentioning **PUBLIC WORKS**

to the amount of Vinsol resin dissolved in the extract from the mortar.

3. Although an amount of NaOH is found in the extract which is in excess of that needed to neutralize all the Vinsol resin in a cement, only a portion of the Vinsol resin in the cement is dissolved.

4. When neutralized Vinsol resin (sodium resinate) is interground with cement, a good correlation is found between the Vinsol resin content of the cement, air content of the mortar, and Vinsol resin content of the extract from the mortar.

5. Cements with equal amounts of neutralized Vinsol resin exhibit no greater variability in air-entrainment than do cements containing no Vinsol resin.

In the discussion of this paper considerable attention was paid to time of mixing, especially that during delivery of transit-mixed concrete, and its effect in producing undesirably high air-entrainment, to the extent of weakening the mortar. Commenting on this, Mr. Wuerpel said that they find that there is an increase in air content with continued mixing, but that "the increase in air with mixing time is less with neutralized Vinsol resin than with flake Vinsol resin. This seems reasonable, when it is considered that the flake Vinsol resin is completely inert when it enters the mixer and its activity depends entirely on its ability to go into solution and neutralize or be neutralized by the readily soluble alkalies in the cement during the mixing period. With continued mixing more and more of the solution neutralization should occur with consequent additional entrainment of air. Since neutralized Vinsol resin depends on no reaction in the mixer the effect of mixing time may not be so great."

This matter of delivery of central plant concrete over long distances was studied by the Warner Co., of Philadelphia, whose business this is, and extensive tests were carried out with concrete mixed according to Pennsylvania State Highway Dept. specifications. The conclusions reached were:

1. With Pennsylvania Highway one-course-pavement mix, with a low water content, it would be safe to supply concrete made with selected air-entraining cements to jobs lying within an economic haul of the company's Philadelphia distributing yards.

2. Before a job was to be served with air-entraining type of cement concrete, it would be advisable to run batches of the proposed mix, having the desired slump, in the laboratory mixer and determine the percentage of air entrainment.

3. The air entrainment in the laboratory mixer is slightly greater than the air entrainment found in the work upon delivery by the concrete trucks. This was felt to assure the company that satisfactory results obtained in the laboratory would be satisfactory at the site of the work.

4. Administered with a proper control at the central mixing plant and with modern agitator bodies, including the horizontal, closed-drum type and/or the high-discharge, open-end type, for delivery to the site of the work, satisfactory concrete can be delivered with a very small percentage in variation of slump, volume, and strength.

5. Warner Co. should, and did, enter into contract for the servicing of several concrete highways within the City of Philadelphia. This work was in April of 1944. The results have been entirely satisfactory to the State Highway Department of Pennsylvania and the contractor.

Some modifications in normal construction practice are necessitated by the special characteristics possessed by air-entraining portland cements and the con-

cretes made from them, which may be summarized as follows:—(1) as air-entraining cements are more fluffy and flow more freely when dry than untreated cements, particular care to prevent leakage must be taken when handling or transporting the cement in bulk. Batching equipment must permit a complete shutting off of cement when the correct amount has entered the hopper. (2) The cement content per unit volume should be at least equal to that used in ordinary concrete. (3) The increased volume of mortar and the inherent workability of the concrete permit a reduction in the sand content of about 3 per cent of the total weight of sand and coarse aggregate, and in the water content of about ¼ gal. per sack of cement. (4) The mixing time for normal portland cement concrete (60 sec.) is adequate for concrete made with air-entraining cement. (5) As there is little free surface water, finishing should be done without delay, enabling finishers to follow closely behind the mixer. (6) If the concrete tends to stick to the screeds of the finishing machine, the transverse oscillations may be increased in relation to the forward motion. Six to eight oscillations per foot of forward travel have been found satisfactory. (7) For hand-finishing, steel or steel-shod floats have in some cases given better results than wooden ones. Hand-finishing should follow closely behind the finishing machine.

Water Distributing System as Public Utility

A water distributing system accustomed to deliver water to about 75 residences in an unincorporated residence district adjacent to a municipality in consideration for monthly payments is a public utility and subject to the regulation of the railroad commission under the California Public Utilities Act. Trask v. Moore, California District Court of Appeal, 140 P. 2d 73.

Airports for Heavy Planes Needed

Plans of United States airlines to use giant planes on inter-American commercial air routes have increased interest in the availability of airports capable of handling these transport planes. Few such airports now exist in the other Americas.

Already Pan American World Airways has disclosed plans at a hearing before the Civil Aeronautics Board to purchase for its services in the Americas 9 Douglas DC-7 4-engined, 108-passenger planes, 18 Lockheed Constellation 4-engined, 56-passenger planes and 23 twin-engined "Type 12" planes of 20,000 pounds gross weight by a maker not yet named.

Similarly, Pan American-Grace Airways (PANAGRA) has announced it has contracted to buy three Douglas DC-6 4-engined, 56-passenger planes. PANAGRA's recent advertising has also mentioned contemplated use of Lockheed Constellation 300-mile-an-hour planes and Douglas DC-4 4-engined, 44-passenger planes on its routes.

The Civil Aeronautics Administration has set up classifications for airports which divide them into five classes in regard to number and length and width of runways and landing strips, clearance, altitude, and facilities. Altitude is included because the higher the airport is above sea level, the more rarefied the atmosphere and the longer must be the landing strip to conform with safety requirements.

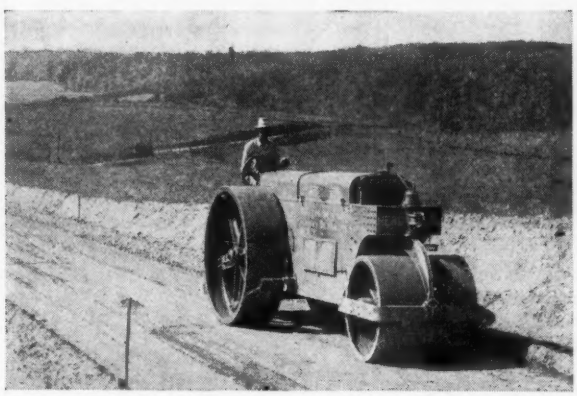
Under this classification system, planes having a

WARCO MOTOR GRADERS *and* HERCULES ROLLERS
are *First Class* Construction Equipment . . .

A WARCO Grader maintaining an Arkansas road

WARCO—The Easy-to-Operate, Dependable Hydraulic Control Graders!

One man machines which do an accurate, fast job on tough construction or light maintenance. And remember—Hydromotor operation is smooth, easy operation, with minimum upkeep.



A HERCULES Roller on road construction in Maryland

You can't beat a HERCULES ROLLER for a fine rolling job!

When equipped with the *IRONEROLL* the HERCULES becomes a tandem unit that smooths to hump-free perfection without cross rolling. It's HERCULES—for less rolling—less expense—successful results! *Write for circulars and full details.*

BUILT BY **W. A. RIDDELL CORPORATION and HERCULES ROLLER COMPANY**
BUCYRUS, OHIO

gross-take-off weight of 74,000 pounds and over require a Class IV or Class V type of airport with landing strips equivalent in safety to strips 4,700 feet and 5,700 feet and over in length, respectively, at sea level to comply with the safety requirements of the Civil Aeronautics Administration. In the case of smooth bituminous and concrete surfaces, a shorter ground run is required to attain take-off speed than if the surfaces are of loose gravel or of soft sod, and, conversely, a smaller landing area may be used.

The Douglas DC-7 plane is reported to have a gross take-off weight of 162,000 pounds and to cruise at more than 300 miles an hour. The manufacturer claims for the Douglas DC-6 a maximum cruising speed of 334 miles per hour and a normal cruising speed of 278 miles per hour; at 60 per cent rated power at 10,000 feet altitude; for the Douglas DC-4, maximum cruising speed of 280 miles per hour and normal cruising speed of 239 miles per hour. Gross weight of the Douglas DC-6 plane is 80,000 pounds and of the Douglas DC-4 plane, 71,300 pounds, according to the manufacturer.

For reasons of military security, the exact number of Class IV and Class V airports in the 20 other American republics has not been made public, but their number is conceded to be smaller than postwar air transport will require for a high standard of service.

According to the Air Transport Information Division, Civil Aeronautics Board, at the close of 1944 there will be between 300 and 400 Class III or better airports in the other Americas capable of handling the twin-engined, 21-passenger plane currently in general use on the main air routes there. A Class III airport at sea level has landing strips 3,700 feet to 4,700 feet in length. Altogether, the other American republics will have approximately 2,400 airports of all types by the close of 1944.

Five-Year Engineering Courses At Cornell

As an answer to the problem of adequately training engineers for the leadership they will eventually assume, Cornell University will require five years instead of the conventional four for a bachelor's degree in all branches of engineering after the war.

The developments of science demand a sound technical training. Any reduction in this area would weaken a graduate's knowledge for carrying forward the advances of science. Various studies made by those interested in the engineering profession have always indicated the need for broader training. By taking more time, the program can achieve this objective.

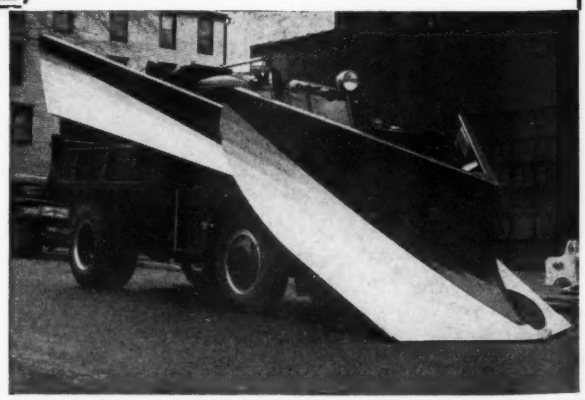
For a bachelor's degree under the five-year curricula, 180 credit hours will be required, of which not less than 125 will be given to scientific and technical courses, and not less than 36 to managerial and non-technical courses. Opportunity is thus afforded students to acquire a better knowledge of economics, English, history, philosophy, government, sociology and other liberal subjects. The non-technical subjects will be arranged in sequential order throughout the five years, running parallel with the technical studies.

FRINK SNO-PLOWS
TRADE MARK REG.

FOR STREETS, HIGHWAYS, AIRPORTS

"V" TYPE

There's a Frink "V" Type Sno-Plow for every size of motor truck from 1½ tons up to 10 tons capacity . . . 8 models of varying moldboard heights and three different widths at the cutting edge . . . so you can select a size that exactly fits your own snow conditions and the capacities of your trucks . . . without overloading them . . . and they are all self-ballasting . . . an exclusive Frink feature . . . available with or without side Leveling Wings . . . hand or full power hydraulic control . . . may be used interchangeably with the blade type Sno-Plow.



ALSO ONE-WAY TRIP BLADE TYPE

Write for the full FRINK Catalog TODAY.

CARL H. FRINK, Mfr., CLAYTON, 1000 Isl., N. Y.
DAVENPORT-BESLER CORP., DAVENPORT, IOWA
FRINK SNO-PLOWS OF CAN. Ltd., TORONTO, ONT.

The Wabash River Flood at Vincennes

(Continued from page 12)

deep before it could be stopped, had prevented the trucks from dumping the dirt where it could be put in the boxes. The river was still rising rapidly and was nearly to the top of the concrete seawall. If it got over this concrete before the dirt was in the mud boxes it would flood the city and all the hard work that had been done would be lost.

The troops had been working since early morning without stopping and were tired. But they formed a line in the water and, working harder than ever, passed filled sandbags from hand to hand. In this manner the 200 foot gap in the mud boxes was filled in. And not a bit too soon. At 2:15 A.M. Friday morning the gage at the river bridge read 26.77 feet. At the north end of the river wall the water was 9 inches up on the mud boxes or 27.75 feet. At this time several breaks occurred in the levee on the Illinois side of the river, which allowed the water to pour into the Allison Prairie and caused a rapid drop in the water level in the river. Due to this drop the workers were able to go along the levees reinforcing all the weak spots that could be found.

The water started to rise again and the government engineers still predicted that the 27 ft. crest would be reached when the Allison Prairie basin filled up. Due to the inundation of the land on the Illinois side, the Fifth Service Command of Fort Benjamin Harrison rushed 16 amphibious jeeps to help in the rescue work. The U. S. Coast Guard at Evansville sent several of their boats also. Although ample warning had been given the farmers to evacuate, quite a number did not leave in time; but due to the quick work of the jeeps and Coast Guard boats nearly all were taken out safely. I believe there were only two lives lost due to flood water.

On Sunday, May 23rd, at 12:15 A.M. the river reached a crest of 26.99 at the river bridge. This was only .01 of a foot less than the 27 foot predicted by the government engineers. Where on Thursday when the river bridge gage read 26.77 the water had been 9" up on the mud boxes, this time when the gage read 26.99 it did not come to the top of the concrete seawall at its north end. The river stayed at this crest until 3 P.M. on May 23rd. At this time a surge of water 3 feet high occurred in the river south of Vincennes, caused by flood water from the Embarrass river in Illinois. This surge caused a break in the Brevoort levee 15 miles south of the city, which caused the pressure at Vincennes, but made it possible for the flood water to back up through the lowlands south of Vincennes into the city. However a hole was blasted in the levee at the White river south of Vincennes, which allowed the overflow water to escape this way.

The troops stayed in Vincennes to patrol the levee until May 28th when all danger of flood was over. Some of the troops from George Field stayed to help the city employees remove the sandbags and mud boxes from the walls. Without the help of these troops, particularly the engineer companies from Camp Atterbury, Vincennes could not have been saved from serious damage from the flood. The citizens of Vincennes realized this and started a campaign to raise money to repay in a small way the debt owed these men. A considerable sum was raised and turned over to the various troops who had helped fight the flood.

In fighting the flood, 100,000 sandbags were used, and 80,000 feet of lumber in constructing the mud

PUMPS THAT *EXCEED* THEIR PROMISES

3000 Gallon "Bantam". Other sizes to 10".

Guaranteed performance is minimum performance for Jaeger Pumps. They prime faster, deliver rated capacity under tougher conditions and for thousands of hours longer than ordinary pumps of the same size and rating. Built for heavy duty work.

Individually tested and certified. See your Jaeger distributor for sales, rentals or service.

THE JAEGER MACHINE CO.

400 Dublin Ave., Columbus 16, Ohio

Jaeger Engineered Equipment includes Mixers, Hoists, Compressors, Crane Loaders, Paving Machinery

YOUR AIRPORT

. . . whether it be a way-station or a terminal on the HIGHWAYS OF THE AIR, requires radio facilities especially designed for the services you offer. Without adequate radio equipment your airport cannot perform its proper function.

DESIGN: Fortified by years of experience in designing airway and airport radio equipment, RADIO RECEPTOR engineers offer you a vast store of specialized knowledge.

MANUFACTURE: Civilian radio equipment manufactured by RADIO RECEPTOR meets the same high standards as set for CAA and the Armed Forces, and will be produced by the same personnel.

PLAN: Send for your Airport Radio Questionnaire, and let us help you plan adequate radio equipment for your airport . . . NOW!

Non-technical booklet, "HIGHWAYS OF THE AIR," available on request. Address Desk W

We invite an opportunity to cooperate with Engineers, Consultants and Local Contractors.

RADIO RECEPTOR CO., INC.

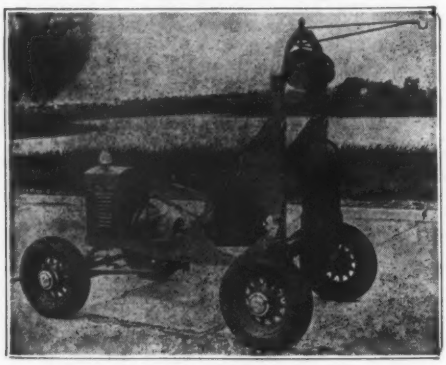
251 WEST 19th STREET NEW YORK 11, N. Y.

Engineers and Manufacturers of Airway and Airport Radio Equipment
Communications Equipment • Industrial Electronics • Electronic Heating Equipment

SINCE 1922 IN RADIO AND ELECTRONICS

When writing, we will appreciate your mentioning **PUBLIC WORKS**

KEEP THOSE SEWERS OPEN!



Sewers clogged with sand, roots and other debris are a constant danger to public health and safety. New installations rapidly lose their efficiency due to sand seepage.

You positively can keep the sewers of your city open with an OK Champion—the cleaner that does the entire job from street level. Dig-ups practically a thing of the past.

Three Distinctive Models Available. Write Now for Literature.

CHAMPION CORPORATION

4752 SHEFFIELD AVENUE, HAMMOND, INDIANA

STILL IN THE PICTURE!

WITH WESTON GASKETS and FORMS for ALL SEWER PIPE JOINTS

Minimizes infiltration, exfiltration and root intrusion. Although on curtailed production, due to shortage of materials and labor, we can still supply some of you and will welcome your inquiries now.

L. A. WESTON, ADAMS, MASS.

STREET, SEWER AND WATER CASTINGS

Made from wear-resisting chilled iron in various styles, sizes and weights.

MANHOLE COVERS, WATER METER COVERS, ADJUSTABLE CURB INLETS, GUTTER CROSSING PLATES, VALVE AND LAMPHOLE COVERS

Write for Catalog and Prices

SOUTH BEND FOUNDRY CO.

Gray Iron and Semi-Steel Castings

SOUTH BEND, IND.

The Manual of Sewage Disposal Equipment and Sewer Construction is a year 'round exhibit of the latest equipment and materials.

When writing, we will appreciate your mentioning **PUBLIC WORKS**

boxes. All the material used, except about 70,000 bags, was procured in Vincennes. After the water had receded, the B&O Railroad bought nearly all the filled sandbags and used them for temporary filling in a long section of their track on the Illinois side which had washed out. The dirt in the mud boxes was used to construct a levee along Niblack Drive, where the temporary sandbag levee had been. The lumber in the mud boxes was sold to a lumber dealer.

After the experience gone through during the flood, I am sure there will be no trouble convincing the people of Vincennes that additional flood protection is one of the first post-war projects to be considered.

Capacities of Sewage Gas Meters

Unforeseen increases in population and establishment of industries that discharge liquid wastes into the sewers make it impracticable to determine, in designing a sewage digestion and gas utilization system, just what size of gas meter to install. But the Pittsburgh-Equitable Meter Co. recommends using, as a basis for gas production from domestic sewage, 0.8 cu. ft. per day per person, and that the meter be run at not more than 60% of its maximum rated capacity. It may be necessary to double the capacity if all of the city's garbage is digested with the sewage; and industrial wastes may necessitate even greater allowances. This of course applies to the gas pipe system also.

Gas Explosion in Disposal Plant

At Somerset, Ky., on Sept. 30, an explosion of sewer gas seriously damaged a sewage disposal plant erected three years ago at a cost of $70,000. The blast was felt for miles and almost destroyed the plant's pump house, shattering its reinforced foot-thick concrete walls.

Several months are expected to be required for resumption of operations.

Soil Movements as Affecting Paved Surfaces

(Continued from page 18)

of the subsoil in dry weather may be harmful, as in the case of agricultural land. The problem which the engineer has to try and solve is that of removing excessive water in wet weather and maintaining a reasonable degree of moisture in the subsoil in dry weather."

Frost heaving may be of slight importance in England, but that is far from being the case in the northern belt of this country. The state highways of Ohio are said to be damaged by frost to an extent estimated at 1½ to 2 million dollars each winter. The mechanics of frost heaving may be described as follows:

When water freezes, its volume increases by about 9%. It would therefore appear that a soil containing one-third its volume of water would expand about 3% when that water froze—say ⅜ inch if it froze to a depth of 12 inches. As a matter of fact it expands several times that amount, as evidenced by the fact that a stone on top of frozen loam, if heated, will sometimes be found to settle several inches.

When wet soil freezes, ice lenses or layers are formed by the growth of ice crystals by gradual accretions—when the moisture already in the soil freezes it permits additional moisture to enter, which in turn freezes,

and this is continued while the favoring conditions last, so that the total moisture freezing is several times the moisture capacity of the soil. Moreover, it freezes as crystals, not into a solid mass but into one with a considerable volume of interstices between the individual crystals. The conditions producing such actions are capillary saturation of the soil, a high percentage of fines, a free supply of water, and a gradual decrease in temperature.

Capillary saturation and free supply of water are controlled by the groundwater elevation and the capillary capacity of the soil. Heaves are most common in silty soils. The change in soil temperature lags behind that of the air, so the average air temperature must remain below freezing for some time before the soil begins to freeze, and freezing temperature penetrates downward into the soil slowly.

If the actual heaving and subsequent thawing are uniform over the full width and a considerable length of a concrete road or one with a concrete base, it may be that little damage will result. But if soil conditions cause variations in the amount of heaving, even rigid pavements may be cracked badly. In the case of gravel or other non-rigid roads, some trouble may occur during the freezing and expanding stage, but the serious conditions occur when the ice turns to water, removing the support of the solid crystals and releasing into the soil far more water than its maximum capacity for absorption.

At least three methods of preventing frost heaving have been utilized successfully: 1—Lowering the groundwater table by drainage. This diminishes the amount of heave and removes the excess water released by thawing. 2—Introducing a layer of impermeable material to retard capillary movement. This involves removing the soil to the depth to which frost penetrates and replacing the lower part of it with the impermeable material. 3—Replacing all the soil to frost depth with impermeable material.

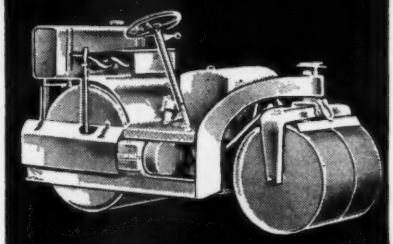
These methods are usually expensive and not always practicable. A fourth method, which is much less expensive and has been employed successfully on a number of highways, is to mix a small amount—about 0.5%—of calcium chloride with the soil. This lowers the freezing point so that a lower temperature is required to produce ice; and if ice crystals form, they expel the chloride in solution, thus increasing the saturation of the adjacent water and lowering its freezing point still further. The calcium chloride can be applied to the surface of a gravel, macadam or dirt road as either flake, powder or solution. In constructing new roads it is usually mixed dry with the soil. It can be introduced under existing concrete slabs by drilling holes through the slab and soil at intervals of about 6 ft., filling the hole with dry flake up to the concrete and recapping the concrete hole; or it may be introduced by a mud-jacking equipment; or by introducing it in solution through a perforated pipe driven under the pavement from the shoulder.

Tests of Traffic Paints

In 1942 the Traffic Paint Committee of the American Society for Testing Materials appointed a group of seven to study tests for abrasion, adhesion, flexibility and hardness of traffic paints; the purpose being to determine the value of these tests in estimating the behavior of traffic paint in service, and possibly recommend certain methods of tests.

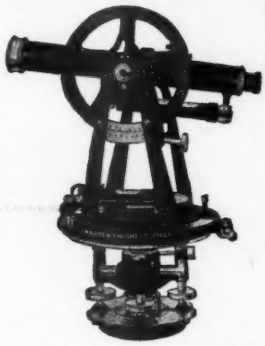
Each member tested paints obtained from eight dif-

C. H. & E. CONSTRUCTION EQUIPMENT



3 Ton Tandem Roller
For maintenance patch work, and airports. Operates same as an automobile, with slow forward and reverse speed, controlled by one hand lever. Both front and rear rolls can be filled with water. Easy to load on a truck for transportation from job to job.
Write for Bulletin
3841 N. PALMER STREET

SAW RIGS · PUMPS · HOISTS · MORTAR MIXERS · TANDEM ROLLERS · BAR BENDERS · BAR CUTTERS
C. H. & E. Manufacturing Co.
Milwaukee, Wis.



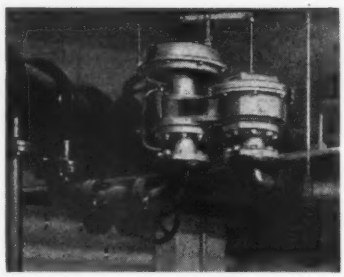
WARREN - KNIGHT
TRANSITS and LEVELS
are precision instruments of highest quality.
Stocks are limited—due to our facilities being used in making special precision instruments for the U. S. Government—but priority orders are being accepted, and filled as quickly as possible.
Guaranteed Rebuilt Transits and Levels for Sale or Rent.
We are prepared to REPAIR Engineering Instruments of any make and to furnish Engineering Field Equipment and Drafting Room Supplies of all kinds.
Write for Catalogue PW-912
WARREN-KNIGHT CO.
Manufacturers of Sterling Transits and Levels
136 N. 12th ST. PHILA. 7, PA., U. S. A.

SEND FOR LATEST CATALOG OF
HIGH SPEED SNOW PLOWS
FRED GETTELMAN CO.
4400 W. STATE ST. MILWAUKEE 8, WIS.

USE THIS COUPON
Fred Gettelman Co., 4400 W. State St., Milwaukee 8, Wis.
Without obligation, please send me your latest catalog of High Speed Snow Plows.
Name _____
Street _____
City _____ State _____

When writing, we will appreciate your mentioning PUBLIC WORKS

P.F.T. Flame Traps Protect the Sewage Treatment Plants of Over 235 War Projects



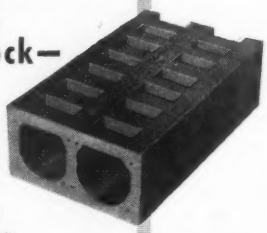
In camps and armament plants throughout the nation, the fire and explosion hazards created by sewage gas at the disposal plants are eliminated by P.F.T. Flame Traps. P.F.T. Boiler Room Equipment is preferred.

Write for Bulletin No. 121-A describing P.F.T. Flame Traps, Pressure Relief Valves, Waste Gas Burners, Condensate Drip Traps, Pressure Gages and other boiler room accessories which assure safe operation of digested sewage sludge treatment plants.

P.F.T. PACIFIC FLUSH-TANK CO.
4241 Ravenswood Ave., Chicago, Ill.
NEW YORK—CHARLOTTE, N. C.

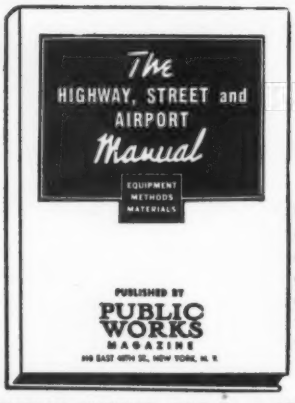
BOSCO

ARMCRE
Filter Bottom Block—
A recognized standard for trickling filter systems. Meets ASTM specifications.



Also
Bosco Perforated Plain End Drain Pipe and Tru-Line Collars

BOWERSTON SHALE COMPANY
BOWERSTON, OHIO
Drainage Material Specialists

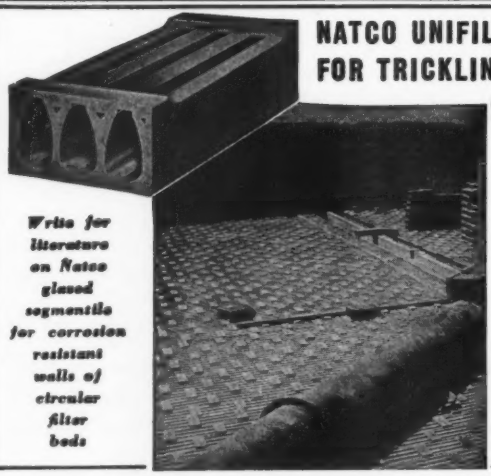


The Standard Source of Unbiased Information

About equipment and materials!

This Manual describes and illustrates *all* types of equipment and material for highways, streets and airports and tells what each can do. If you don't have a copy of this valuable Manual, send $1 for one today. Money back in 10 days if not entirely satisfied.

PUBLIC WORKS, 310 East 45th St., New York 17, N. Y.



NATCO UNIFILTER TILE FOR TRICKLING FILTER SYSTEMS

One piece underdrain
Egg-shaped run-off
Rapid, complete ventilation
Salt glazed surfaces

Write for literature on Natco glazed segmentile for corrosion resistant walls of circular filter beds

NATIONAL FIREPROOFING CORP.
PITTSBURGH PA.

When writing, we will appreciate your mentioning PUBLIC WORKS

ferent producers. One member, Charles W. Allen, of the Ohio State Highway Dept., made service tests of the paints on Ohio highways of concrete, brick and bituminous pavements. Meeting in 1943, the members compared results and found no correlation between the hardness, adhesion and flexibility tests on the one hand and abrasion tests or field service on the other. But close correlation was found between the abrasion tests of two members of the group and the field service tests, and further abrasion tests were continued during the following year.

Results were again studied by the group this year, and they reported that:

"Results of the work to date, as outlined above, lead to the following conclusions:

"1. The adhesion, flexibility, and hardness tests examined show no general correlation with field service behavior.

"2. The abrasion test developed by Mr. Leavitt and the combined accelerated weathering and abrasion tests developed by Mr. Hickson and Mr. Werthan show very close correlation with field service behavior of the samples of traffic paint examined."

State Aid on Sewage Disposal Plans

Oregon cities that plan to construct sewage disposal facilities after the war will be aided in designing their plans by a survey to be made by the engineering experiment station of Oregon State College and sponsored by the state sanitary authority. Funds for the survey will be provided on a cooperative basis by the state sanitary authority, the state board of health, the state game commission, the hydroelectric commission, and the state college. All cities included in the survey will be required to secure a record of the volume of sewage and samples for chemical analyses, and the survey staff will suggest the method and the degree of treatment necessary for each city.

May a Municipality Lease Unopened Streets?

Ordinarily, a municipality holds only an easement for travel in land dedicated on a plat as a public street. This is usually true also of land acquired for street purposes in any other way. Therefore, usually the owner owns the fee title in the land subject only to the easement of the municipality for street purposes. The municipality consequently may use the land only for the purposes of a street. This may include construction and maintenance of a roadway for travel, sidewalks, and the placing of communication lines and utility conduits within the boundary of the mapped street. The right to use the land in an unopened street for buildings or agriculture or for any other use not connected with a street easement belongs to the abutting owners (each to the middle of the street) and not to the municipality. Hence, the city or village has no authority to lease or grant rights in an unopened street for any such purpose. The abutting owners may maintain ejectment, trespass, or other appropriate action to protect their rights as owners of the fee subject to the public easement. *Sanborn v. Van Duyne* (1903), 90 Minn. 215, 96 N. W. 41.

In rare cases municipalities have acquired by warranty or quitclaim deed a fee simple title to land intended for eventual street use. In such instances, where there is no restriction in the deed, municipal uses are not limited to street purposes. Consequently, the municipality itself may use the land for non-highway

purposes, and if the land is not presently needed for street use, it may lease or grant rights in the land to private individuals for any legitimate use. — From *Minnesota Municipalities.*

A City-Wide Street Tree Plan

Cleveland, Ohio, has set aside $50,000 for a street tree program for the last four months of 1944. A city forester and staff have been employed and the program of the city's bureau of forestry for next year calls for an expenditure of $250,000. The city has five thousand requests for tree repair work to be done. The general street tree program of the city includes (1) the repair and maintenance of existing trees, including trimming, surgery, spraying, and removal of dead trees and limbs; and (2) planting of new trees only where the need is urgent at first with gradual speeding-up as repair and maintenance work relaxes.

Financing Cleveland's Airport

The Ohio Supreme Court recently held (City of Toledo vs. Jenkins) that a municipal airport is a utility, which makes it possible for a city in that state to issue revenue bonds for constructing airports. The city of Cleveland proposes to raise $5,000,000 by this means for rebuilding its airport. Prior to the war, in order to encourage private investment, the city had granted long-term leases on airport land, and airline companies put up their own hangars, with the result that the city had no control over the buildings or land. The practice of granting long-term leases to commercial airlines and other private companies has been discontinued and existing leases are being renegotiated. The city intends to own and maintain all buildings and place the operation of the airport in the Utilities Department, making charges on a landing-fee basis—a fixed amount for a certain number of flights in a specified period.

Diatomaceous Earth Filters for Water Purification

(Continued from page 22)

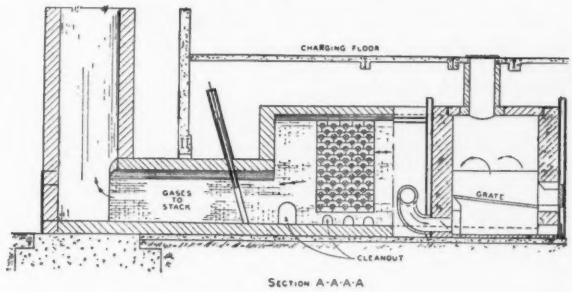
the diatomaceous earth also affects capacity. Porous refractory materials used in sewage and water treatment plants, expanded metal and wire-wound frames have been used satisfactorily. A recent development is a porous rubber sleeve that fits over other types of tube supports. This maintains a good rate of operation without clogging, which occurs from time to time with other media; however, cleaning of clogged septa is not generally difficult.

Backwashing flushes the dirty mat (of filter-aid and removed suspended material) from the septum and out of the filter. To prevent contamination of the interior of the filter, treated water must be used for backwashing. Some work has been done on recovery and reuse of filter-aid. While it is possible that a material reduction in operation costs could be accomplished if satisfactory procedures for washing and recovery were developed, no reliable data are now available as to the possibilities.

Present manufacturers of diatomite equipment probably can furnish only small pressure units, and may not be able to supply these for the present. Manufacturers include Wallace & Tiernan Co.; Infilco, Inc.; Titeflex Hose Co.; Proportioneers; and Permutit Co.

"FITCH"

RECUPERATORS FOR INCINERATORS

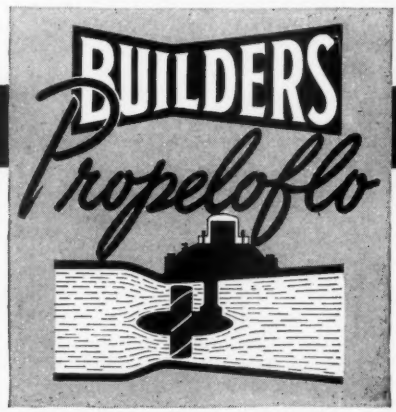


SECTION A-A-A-A

AN INCINERATOR necessity is a good recuperator. "Fitch" Recuperators combine Thermal Conductivity, Great Strength and Accessibility.

Write for Bulletin No. 11
"RECUPERATORS FOR INCINERATORS"

FITCH RECUPERATOR CO.
PLAINFIELD NEW JERSEY



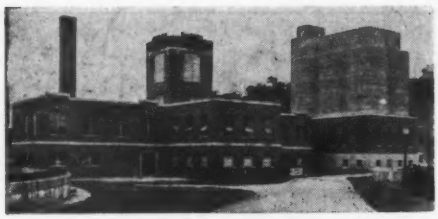
CHECK THE ADVANTAGES OF THIS
MAIN LINE FLOW METER

- √**LOW COST: Complete in itself and easily installed.**
- √**ACCURATE: Within 2% over wide range of flow.**
- √**DIRECT READING: Counter totalizes flow directly in gallons.**
- √**VENTURI DESIGN: Results in increased accuracy and range.**
- √**BUILDERS QUALITY: Superior design and workmanship for over 50 years.**

For Bulletin 350 attach to your letterhead and mail to Builders-Providence, Inc. (division of Builders Iron Foundry), 9 Codding St., Providence 1, R. I.

Sincerely Yours
BUILDERS-PROVIDENCE

***When writing, we will appreciate your mentioning* PUBLIC WORKS**



Chemical houses of the Kansas City, Mo., water softening plant; storage silos at the right.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

Measuring Hardness, Calcium and Magnesium

After three years of study in the Mt. Prospect laboratory, Brooklyn, N. Y., a simplified apparatus and technique for determining hardness by the "soap hardness" method has been developed. It was learned that the foam-rise criterion is a more satisfactory and scientifically based end-point than the lather; that by proper conditioning of the sample portion, it is possible to obtain "soap" titrations which are practically equal for waters of equal hardness values, regardless of the ratio of calcium to magnesium present, and that the calcium and magnesium may be determined rapidly and accurately; also that substances which ordinarily interfere with the conventional procedure do not interfere with this method. An "aero-titrator" apparatus was developed for this purpose and a reagent which is a buffer type of solution and highly alkaline is employed.[F76]

Shallow Wells In Dismal Swamp

For about ten years Elizabeth City, N. C., has obtained its water supply from shallow wells in Dismal Swamp, where the soil formation is about 5 ft. of topsoil over 25 ft. of fine sand, followed by 50 ft. of clay, under which is sand containing salt water. War conditions made it necessary to increase the supply by at least 400,000 gpd, and 109 new shallow wells have been constructed, spaced about 325 ft. apart. Profiting by experience with the old wells, where sand entering the system gave some trouble, the wells were constructed as follows: A 10″ steel casing 30 ft. long was jetted down and cleaned out. Then a 2″ pipe ending in 5 ft. of 1¼″ slotted screen was set in the center of this casing and gravel packed around it and sealed at the surface with 2 or 3 ft. of clay. Then the casing was removed by means of two 20-ton jacks. The screens have slots 0.02 in. wide. The gravel is of 1/16 to ⅛ in. diameter. A vacuum collecting system has been found preferable to individual pumps, because of the limited drawdown available and uniform elevation of the 250-acre field in which the wells are located. The wells are joined to a central pumping station by a system of 6″ to 1½″ pipes, wrought iron with screw joints, in which a vacuum of 15″ to 24″ is maintained. These wells are delivering 400,000 gpd but it is believed that they could deliver 720,000, or nearly 7,000 gpd each.[E19]

Services and Sewers in Same Trench

Maine's State Plumbing Code directs that water and sewage piping be laid in separate trenches "when practicable. If water piping is laid in the same trench as a sewer or house drain it shall be laid at least one foot above the top edge of the sewer and offset at least 18 inches from the central line of the sewer and such sewer or house drain shall be constructed of extra-heavy cast-iron soil pipe with approved leaded and calked joints and shall be tested as provided for house drains."

Rules and regulations prepared by the Public Utilities Commission of Maine state that "water service pipes shall not be placed in the same trench with gas pipes, and may be placed in the same trench with sewer pipes only after a permit has been secured from the Public Utilities Commission."[V8]

Steel Water Tanks in Canada

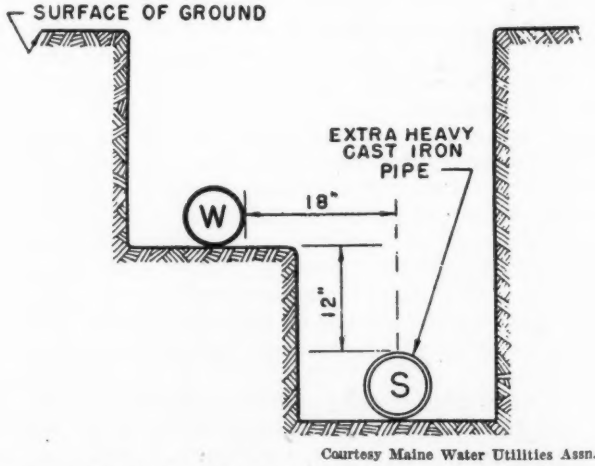
Of 133 municipal water systems in Canada studied by the Ontario Dept. of Health, steel water storage tanks are used in 90; while gravity is available in 7 of the remaining 43. Most of the tanks are covered. The oldest is 70 years old and twelve are 40 years old or more. Of the tanks more than 50 years old, only one is reported as showing bad corrosion. Ice forms in most or all of the tanks, to thickness around the side reported as 7 to 8 ft. in Montreal, but usually limited to 1 ft. to 3 ft.[M20]

Odor Changes Caused by Chemicals

Based on studies at filter plants in 16 cities made by Martin Faye, it was found that coagulating chemicals, including alum and ferric salts, do not influence odor changes and need not affect the ability of carbon to remove tastes and odors. Lime sometimes alters the intensity of an odor and may influence the effect of active carbon. Chlorine in dosages which disinfect water usually produces an intensification of odors; sometimes makes carbon more effective, sometimes less so. Breakpoint chlorination generally reduces the odor intensity, sometimes only slightly. From the point of view of palatability, it is desirable to use chloramine for disinfection since it minimizes any intensification of odors and appears to assist in the removal of them.[A130]

Attractive Business Offices

Business offices of water works too often are not a credit to the utility. An attractive bubbling fountain in the office would be a real attraction. So would cut flowers or growing plants. The offices should be well lighted. Pictures of reservoirs, pumping stations, etc. should decorate the walls. The corporation yards should be provided with loading ramps, truck level platforms, an overhead trolley system with chain hoist, which would greatly conserve labor. The materials should be stacked in an orderly manner or arranged on shelves. Junk piles, if any, should be inconspicuous. The buildings and fence should be kept in repair and painted.[A137]

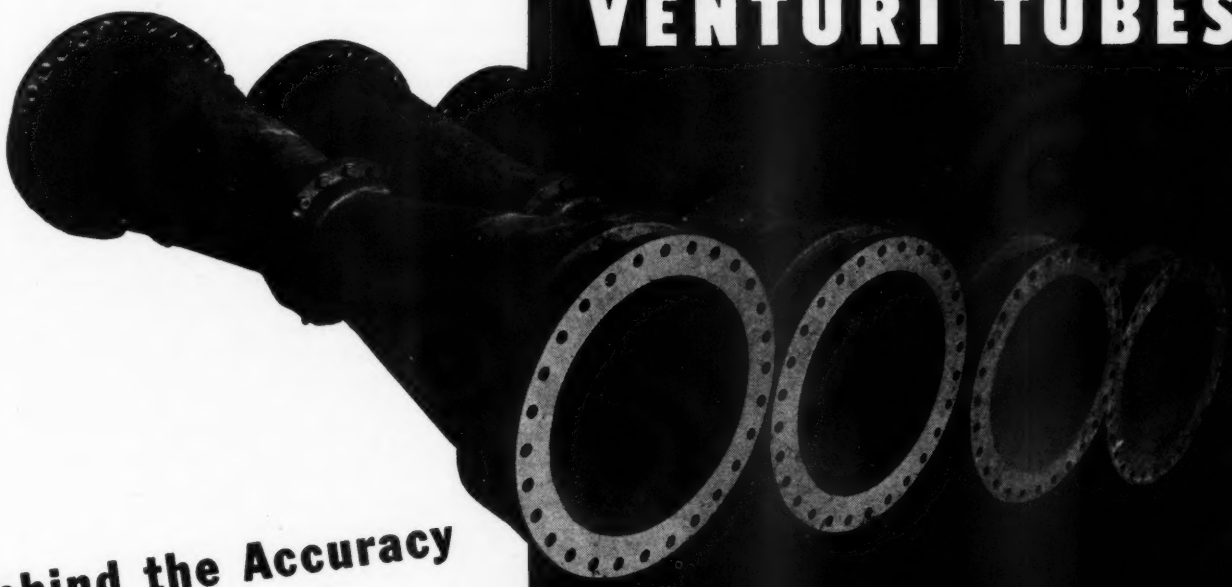


Courtesy Maine Water Utilities Assn.

Direction of Maine State Plumbing Code for laying water and sewer pipes in the same trench.

Specify

SIMPLEX VENTURI TUBES



Behind the Accuracy of the Flow Meter is the quality of the PRIMARY DEVICE

FOR WATER, SEWAGE, PROCESS LIQUIDS, ETC.

1. ***Homologous*** — as to type and form.
2. ***Uniform*** — Cast and machined surfaces.
3. ***Accurate*** — As to piezometer workmanship.
4. ***Dependable*** — As to head-quantity relations produced.

All based on many years devoted to the manufacture and application of Venturi tubes, and continued research.

BLUE PRINT NOW!

SIMPLEX VALVE & METER CO.
6750 UPLAND STREET, PHILADELPHIA 42, PENNA.

When you need special information—consult the classified **READER'S SERVICE DEPT.**, *pages 67-69*

Action of Chlorine On Micro-Organisms

There are three theories of how chlorine destroys micro-organisms: (1) Hypochlorous acid is formed, which liberates nascent oxygen. (2) By the nascent oxygen so liberated plus direct chlorination of the protoplasm of the organisms. (3) By chlorinating the lipoid-protein substance in the bacterial cell wall, to form some toxic chloro-compound which interferes with further cell division and results in the death of the organism. These theories are not supported by direct evidence but are merely deductions from the chemical reactions of chlorine compounds on organic substances.

The author studied the mechanism of destruction of cysts of *E. histolytica* by chlorine and chloramine compounds in water and found that when cysts were exposed to solutions of gaseous chlorine, H.T.H., dichloramine, monochloramine, Halazone and succinchlorimide, there was penetration of chlorine into the cysts. The greater the concentration of titratable chlorine and the longer the contact period, the greater the penetration. The action was attributed to the active chlorine which may oxidize or chlorinate the proteins in the protoplasm. Action by nascent oxygen liberated by HOC1 was not thought probable. It was found that definite destructive changes occurred in cysts exposed to a minimal cysticidal dose of chlorine. These observations may be applicable to the destruction of micro-organisms in general, but recent data indicate that in the destruction of bacteria by chloramine compounds a destructive action takes place that is more specific than the general principles here described.[A131]

GRIFFIN WELLPOINTS
eliminated sheeting—
lowered water level 16 feet
with lake just beyond an earth dike!

See that bone-dry bottom? Results Count!

FOR SALE OR FOR RENT

MID-WEST
GRIFFIN EQUIPMENT CO., INC.
548 Indiana Street • Hammond 1662
HAMMOND, INDIANA

SOUTH
GRIFFIN ENGINEERING CORP.
633 N. Myrtle Ave. • Jacksonville 5-4516
JACKSONVILLE, 4, FLA.

MAIN OFFICE: 881 EAST 141st STREET, NEW YORK 54, N. Y.
GRIFFIN WELLPOINT CORPORATION

When writing, we will appreciate your mentioning PUBLIC WORKS

Management's Six Freedoms

Because in time of war the management of a water utility involves an essential industry directly engaged in producing one of the most vital materiel of war, the A. W. W. A. appointed a committee of 25 men to study top management in water utilities and determine good practices in organization. Five papers presented at the Milwaukee conference as a symposium on the subject are published in this issue of the Proceedings—A133 to 137. In the first of these Mr. La Due said that the waterworks profession deems it essential that top management have six freedoms: To formulate policy; to establish rate structure; to control funds for expansion; to control personnel; to purchase materials and enter into contracts; and in long-term planning and development.

Good management includes sound planning for the future and the coordination of future needs with the financial ability of the utility to provide them. It provides a smooth routine of continuing operations so that, when future needs become urgent, adequate planning (both physical and financial) has already foreseen and made possible the carrying out of them with the least possible disturbance to the utility and its customers.[A133]

Ground Water Supplies

Advantages of ground-water supplies include: The initial cost of installation is generally much less than that of other sources of supply. The operating costs are low. The water is safe, and it is seldom necessary to filter it. The temperature seldom rises above 50°. While it is generally harder than surface supplies, the chemical composition tends to be more constant, without seasonal fluctuations. The pumping plants are compact and require small surface area.

Geographical and engineering studies of the proposed well area should be made by competent experts, and test borings by well drillers thoroughly familiar with ground-water development. It is highly desirable to have the same well contract include both test borings and well drilling. There are advantages in the "water production" type of contract.[A138]

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

A *Journal, American Water Works Ass'n*
November

126. Recovery of Calcium Carbonate or Lime From Water Softening Sludges. By Robert T. Sheen and Herbert B. Lammers. Pp. 1145-1169.
127. Calcining Sludge From a Softening Plant. By H. V. Pedersen. Pp. 1170-1175.
128. Calcining Sludge From a Softening Plant. By Charles W. Gordon. Pp. 1176-1177.
129. Recalcination of Water Softening Sludge. By Frederick G. Nelson. Pp. 1178-1184.
130. Influence of Various Chemicals on Palatability of Drinking Water. By J. W. Hassler and Martin Faye. Pp. 1185-1191.
131. Destruction of Micro-Organisms. By Shih Lee Chang. Pp. 1192-1207.
132. Diatomite Water Filtration Developed for Field Troops. By Hayse H. Black and Charles H. Spaulding. Pp. 1208-1221.
133. Symposium on Waterworks Management and Administration. By Wendell R. LaDue. Pp. 1222-1223.
134. Waterworks Management and Administration in California. By J. S. Longwell. Pp. 1224-1229.
135. Waterworks Management and Administration in Nebraska. By D. L. Erickson. Pp. 1230-1235.
136. Municipal Utility Management in the State of Virginia. By Charles E. Moore. Pp. 1236-1238.
137. Discussion of Papers on Waterworks Management and Administration. By Gerald E. Arnold. Pp. 1239-1241.
138. Utilization of Ground Water in a Postwar Program. By H. Howard Cranston. Pp. 1242-1246.
139. Postwar Planning of Water Works in New York State. By Earl Devendorf. Pp. 1247-1250.
140. Postwar Water Works Construction in the Southwest. By Homer A. Hunter. Pp. 1251-1255.
141. Financing Water Works Improvements in the Pacific Northwest. By G. B. Shunke. Pp. 1256-1259.
142. Balancing the Production With the Sales Record. By A. P. Kuranz. Pp. 1260-1264.
143. Water Utility Liability. By Cornelius T. Waldo. Pp. 1265-1266.
144. Interpretation of the Public Health Service Drinking Water Standards. Pp. 1267-1272.

D *The Surveyor*
October 27

30. District Hot Water Supply. By B. W. Davies. P. 522.

E *Engineering News-Record*
November 16

19. Shallow Wells Tap Dismal Swamp for a City Water Supply. Pp. 108-110.

F *Water Works Engineering*
November 1

75. Reclaiming Lime From Sludge. By Claud R. Erickson. Pp. 1290-1293.
76. New Tool to Measure Hardness, Calcium and Magnesium. By Benjamin C. Nesin. Pp. 1294-1296.
77. Forecast of Postwar Activities. Pp. 1300-1302, 1316.
78. Pump Maintenance Procedure. Pp. 1303-1304.

November 15

79. Water Works for Calloway Mills. By H. E. Wiedeman. Pp. 1346-1348.
80. Forecast of Postwar Activities. Pp. 1359-1360.

G *Water Works and Sewerage*
November

39. Selecting Deep Well Centrifugal Pumps. By Axel A. Fabrin. Pp. 371-376.
40. Build Your Own Lime Solution Controller. P. 400.

J *American City*
November

26. Schenectady, N. Y., Meets Water Supply Crisis. By John H. Burwell. Pp. 72-73, 105.
27. How Lewiston, Me., Repaired a Reservoir Leak. By Lionel E. St. Pierre. P. 84.

M *Water and Sewage*
September

19. Cost of Repairing Old Meters. Pp. 25-26, 50.

October

20. Survey of Steel Water Tanks in 133 Canadian Municipalities. By A. E. Berry. Pp. 15-21, 48-50.

P *Public Works*
November

47. Tunneling Mains Under Railroad Tracks. By C. R. Ridington. Pp. 15, 30.
48. Partial Reconstruction of Ardmore City Lake Dam. By Clarence Harris. P. 19.
49. Ortho-Tolidine-Arsenite Test of Residual Chlorine. P. 24.
50. Protecting a Reservoir from Surface Wash. By Joseph T. Swanson. P. 32.
51. *n*. Municipality's Liability for Projecting Meter Boxes. P. 38.

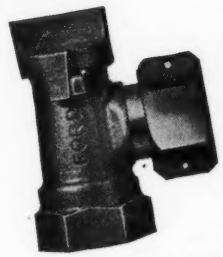
V *Journal, Maine Water Utilities Ass'n*
November

8. Shall Water Mains or Services Be Laid in the Same Trench With Sewer Pipes. By J. Elliott Hale. Pp. 132-135.
9. Pumps. By T. A. Sparrow. Pp. 136-139.

X *Journal, Western Society of Engineers*
September

10. Geophysical Logging of Water Wells in Northeastern Illinois. By Carl A. Bays and Stewart H. Folk. Pp. 248-266.

Ringstyle VALVES



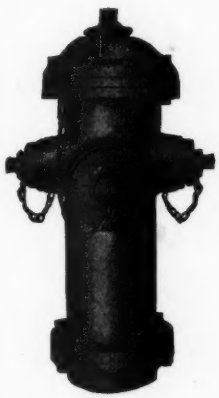
Quality inverted-key angle valves with coupling nuts for water meter attached. Made in three sizes.

Connect to iron, copper or thin-wall lead. Simple. Easy to install.

Ask for further information and free sample of RINGSTYLE Valve.

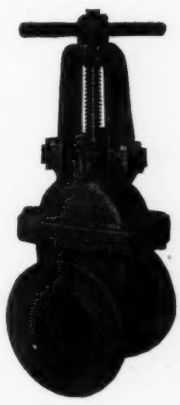
FORD
Meter Box Co.,
WABASH, INDIANA

STANDARDIZE?



By All Means!

No experienced waterworks executive would consider changing makes if *thoroughly* satisfied. Nor would any sensible manufacturer *suggest* doing so.



But many cities call for bids on all requirements and buy on price alone (there is seldom very much difference in price among standard Valves and Hydrants). This results in a hodge-podge of various makes which will be a *continual nuisance* to the waterworks executive—and more expensive to the city, in the long run.

So if you are 100% satisfied with the make representing a majority, by all means *STANDARDIZE*—and earn the blessings of future generations (good equipment will still faithfully be serving your great, great, grandchildren).

RENSSELAER VALVE CO., TROY, N. Y.

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 67-69*

Entrance gate to Princeton, N. J., sewage treatment plant.

The Sewerage Digest

Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.

Estimating Storm Sewer Capacity

An exhaustive investigation was made in 1927 of the capacity of the storm sewers of Harrogate, England, and their ability to handle the run off from all but "extraordinary" storms. The Ministry of Health had authorized the assumption that any rate of rainfall was extraordinary if it exceeded $\frac{30}{T + 10}$ for storms lasting up to 20 minutes and $\frac{40}{T + 20}$ for storms lasting over 20 minutes; T being the duration of the storm in minutes. Run-off was calculated in the customary way, using impermeability and concentration time, and confirmation of the soundness of the calculation adopted is given by the following facts:—

(a) The relief schemes carried out in 1928 and 1929 and based on a similar series of calculations have all proved satisfactory.

(b) Wherever the calculations showed that flooding was likely to occur as a result of storms of exceptional severity, flooding actually has occurred when such storms have been experienced.

(c) Where the calculations showed that surcharging of sewers was to be expected, evidence of such surcharging was found in the manholes affected, where the sewage had headed up to the extent necessary to give the hydraulic gradient which the calculations showed to be required to deal with the flow.

Where surcharge by heavy rains was expected but no serious damage anticipated because the depth of the sewer would allow the hydraulic gradient to increase sufficiently to take the flow, or the storage capacity of the sewers was sufficient to hold the excess flow, or the sewer was so situated with regard to property that occasional flooding would do no harm, expenditure for making such sewer theoretically adequate was deemed unwarranted.[D29]

Reducing Sewer Infiltration

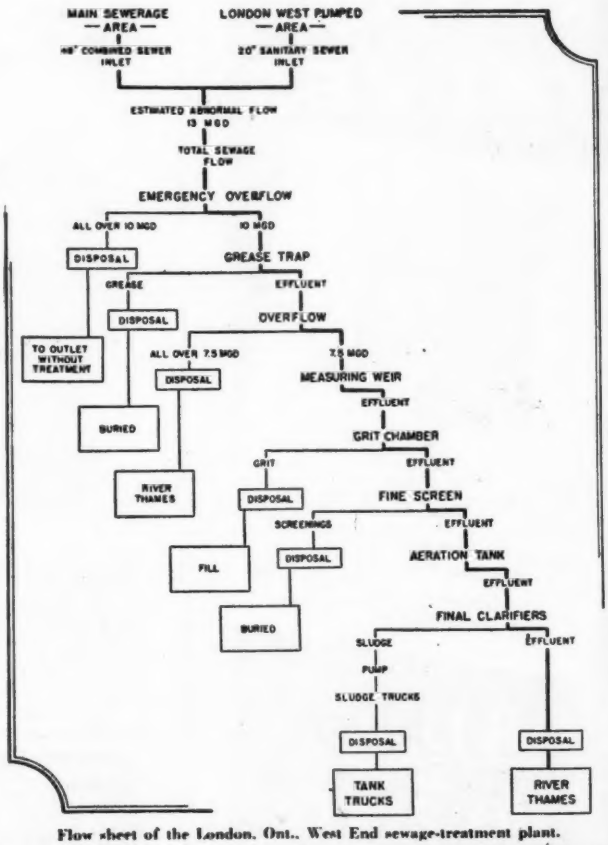
Whether it is economical to reduce infiltration is dependent upon many local conditions. Foremost is the manner in which infiltration finds its way into the sewers. The cost of correcting infiltration that is the accumulation of numerous small leaks through imperfect joints is quite different from that where a large part of the infiltration occurs in a short length of pipe possibly due to broken pipe. In some municipalities ground water is comparatively low in all except certain parts and the infilteration may be localized. In some cases infiltration is indicated by abnormally low suspended solids, in other cases by increased flow after a rain or rise in ground water level. The depth of sewer will have a great influence on the cost of reducing infiltration, as would the character of pavement, the presence of car tracks and the proximity of other utilities.

Having determined the approximate cost of eliminating infiltration, it becomes necessary to evaluate it against the savings which will result from reduced sewage flow. If all of the sewage is pumped against large heads, the reduction of infiltration results in large savings. The character of treatment will also reflect upon the economics of such a proposal.[H48]

Activated Sludge At London, Ontario

London, Ontario, has three treatment plants—a 7½ mgd activated sludge, a 1 mgd activated sludge, and a 1 mgd Imhoff tank-sprinkling filter. The last is overloaded and will be supplemented with an activated sludge unit after the war. Sewage is delivered to the first plant by a 48" sewer which for approximately the last mile is an inverted siphon. Chlorine is applied at the upper end of the inverted siphon, which gives a long detention period and quiescent flow. Rough screening is obtained by a set of parallel quarter-circle bars, cleaned by a paddle wheel which is revolved by the sewage flow, every alternate paddle having fingers on the end which pass up between the bars.

Diffusion in the aeration tanks is obtained in three different ways (1) standard spiral flow with diffuser plates;

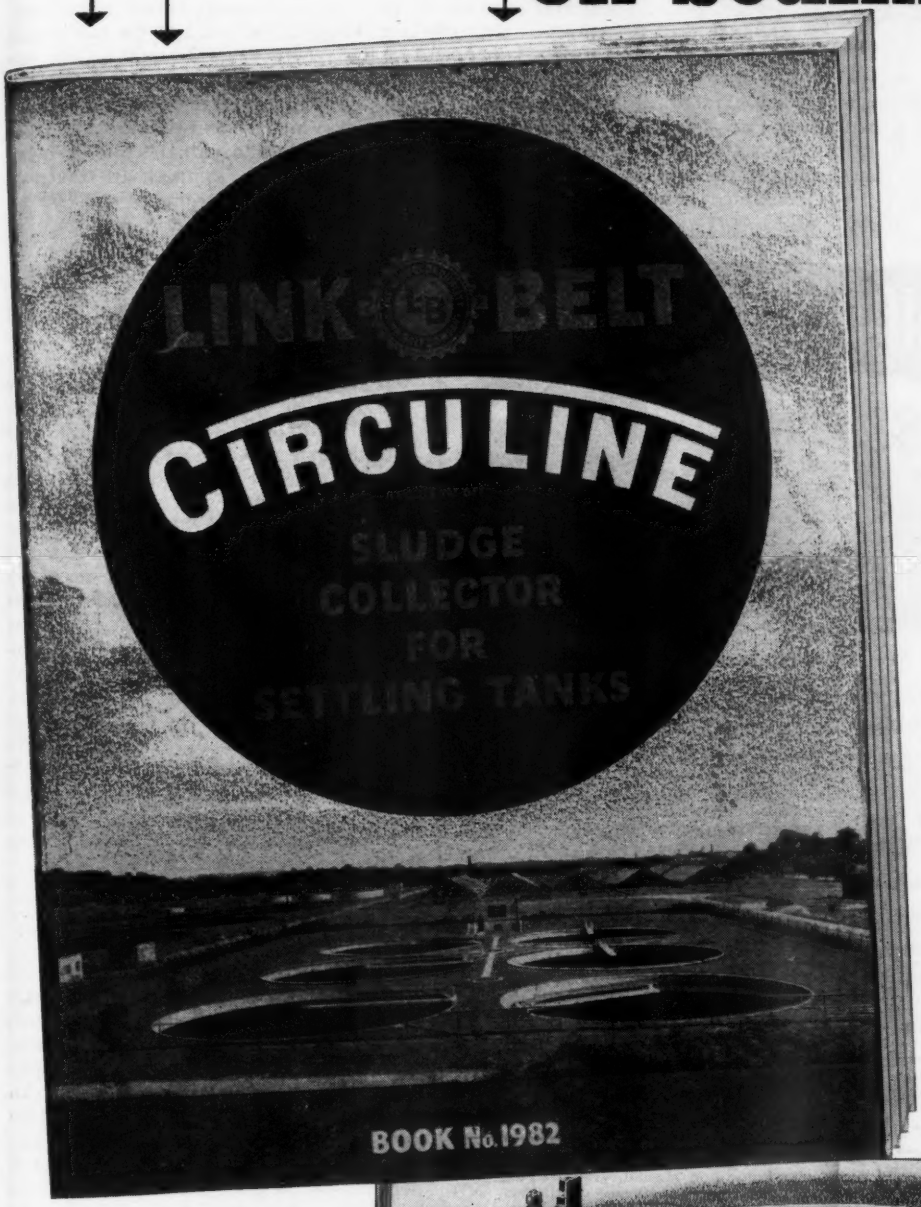


Flow sheet of the London, Ont., West End sewage-treatment plant.

Courtesy Water & Sewage

Flow sheet of the London, Ont., West End sewage-treatment plant.

A NEW BOOK on Sedimentation



• Twenty-four pages of important information on the subject of sedimentation and sludge collection in round settling tanks. It contains photos of numerous installations, capacity tables, dimensions and other pertinent engineering information on Circuline Collectors. Shown for the first time is the new Type "B" collector illustrated below. This unit is especially suited for the treatment of average domestic sewage in round tanks up to 55′ diameter. The Type "A" collector for tanks up to 115′ diameter is also covered in this book. Send for a copy today.

LINK-BELT COMPANY

Specialists in the Manufacture of Equipment for Water and Sewage Treatment

2045 W. Hunting Park Avenue
Philadelphia 40, Pa.

300 W. Pershing Road
Chicago 9, Ill.
Other Plants and Offices in Principal Cities.

9038

(2) through perforated pipes on the perimeter of radial arms which rotate in a vertical plane; (3) perforated pipes cross-wise to the tank, suspended from rods 3 ft. apart longitudinally of the tank, which move slowly 3 ft. forward and back. The third method is said to be simple, effective and low in maintenance cost. The operating costs at this largest plant per million gallons treated were $24.23, which includes $8.38 capital charges, and equals 79 cts per capita per annum.[M10]

Sludge Digestion At Kenosha, Wis.

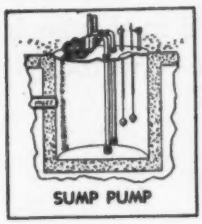
In order to help insure an adequate supply of sludge gas in the Kenosha, Wis. plant a careful check is maintained of sewage solids removed, suspended solids, and raw sludge solids pumped to the digestors, and the optimum length of sludge pumping periods computed from these and analyses of the sludge. This makes it possible to maintain a rather uniform quality of sludge and to regulate gas production in keeping with plant requirements. A pre-determined minimum amount of raw sludge is kept in storage in the clarifier hoppers and tanks, which makes it possible to level out and make more uniform the amount of sludge that is pumped to the digestor twice daily. This method of sludge pumping control is practicable because of the close agreement between the quantities of the computed suspended solids and the raw sludge solids. During 1943 the yearly totals as total solids, suspended solids and sludge solids are nearly in agreement, due chiefly to good sampling practice and laboratory technique. Samples of raw and effluent sewage are taken each hour of the day, the 24 individual samples being proportioned to the flow. Sludge samples are taken at short intervals during the sludge pumping period.[G32]

CARTER Model 701-1½A Self-Priming Industrial Pump

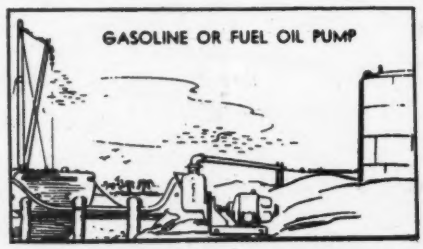
This simple, compact, highly efficient and low-initial-cost pump, pioneered by CARTER, has been widely adopted for use in public works and private industry.

EXCLUSIVE FEATURES of the Close-coupled type pictured above include *Renewable Bronze Pump Shaft*, obviating expensive delays and replacements after extensive shaft wear . . . and *Flexibility of Motor Drive*, allowing use of any standard make of ball bearing motor. As the priming operation does not depend upon any trick impeller or volute, CARTER pumps follow the latest proven designs used in high grade non-priming centrifugal pump construction and have the same non-clogging and high efficient characteristics.

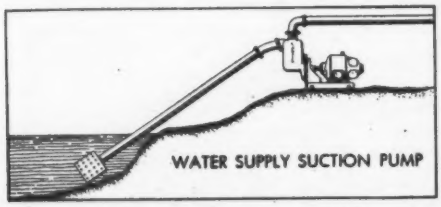
Here are the fields in which Carter Self-Priming Pumps are serving efficiently and economically:



Replacing old vertical submerged type. ADVANTAGES include accessibility of pump and motor, and elimination of long shaft with bearing, vibration and lubrication problems • CARTER Self-Priming Pumps can be placed alongside or away from Sump . . . desirable in some industrial locations.



In this work CARTER Self-Priming Pumps are serving at home and abroad, giving tiptop service under all sorts of adverse conditions.



Wherever the supply source is within suction limit, a CARTER Self-Priming Pump should meet your need. Combines simplicity and efficiency of Centrifugal Pump with suction lift ability of Plunger or Rotary Pump. These CARTER Pumps are widely used by the Army and Navy for permanent and mobile water supply units, as well as by industry • In PUBLIC and PRIVATE SWIMMING POOLS they "vacuum clean" and render filter service . . . and in CONSTRUCTION DEWATERING, CARTER Self-Primers have proven themselves to be "tough pumps for tough jobs."

CARTER Self-Priming Pumps are equipped with stuffing box or seal ring type seal pictured. Either construction provides an effective, trouble-free method of sealing the pumped liquid at rotating shaft. Replacing seal ring or renewal of packing is an easily accomplished operation, requiring only a few moments.

• • •

Submit your pumping problems to our Engineering Department. No obligation of course. Complete details of CARTER Self-Priming Pumps are covered in Bulletin PW-4310. Write for it today.

RALPH B. CARTER COMPANY

Main Office HACKENSACK, N. J. — New York Office 53 Park Place, NEW YORK 7, N. Y.

When you need special information—consult the classified **READER'S SERVICE DEPT.**, *pages 67-69*

Financing Sewerage With Revenue Bonds

There are many conservative bond houses and bond attorneys who are apprehensive of the security furnished by the sewerage system's earnings. The city must show a good record of its collections for other services, and establish an adequate schedule of rates for sewer service to meet all contingencies. It is better to start off with a high rate, and subsequently reduce it as surplus accumulates, than it is to fix as low a rate as possible and later find it necessary to revise the schedule upwards to meet deficiencies. Delinquencies in any utility accounts should not be allowed to continue. There might normally be a small percentage of delinquent accounts anticipated but, when this shows any tendency to creep up, steps must be taken to enforce payment of overdue accounts. It must be borne in mind that delinquencies may increase after the war, and then a surplus and reasonably high rates will be a great advantage.[G31]

Digesting Garbage With Sewage

It appears to be practical and economical to add garbage solids to a sewage digestion tank. The author recommends removing cans, large bones, bottles, etc.; grinding the garbage, using tank supernatant in the grinder; putting the garbage in a series of perforated containers, which travel submerged in a garbage digestion tank during a period of 10 days, which is generally sufficient for complete digestion. Digested material drains out of the perforated containers, undigested material is removed and disposed of otherwise. Supernatant from the sewage digesters flows into the garbage digester for seeding, and liquid from the garbage digester passes to the sewage digester.[X6]

BUY MORE WAR BONDS

Bibliography of Sewerage Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p.* paper before a society (complete or abstract); *t*, technical article.

D — *The Surveyor*

October 6

30. *p.* Huddersfield Sewage Works. By H. H. Goldthorpe. Pp. 483-485.

October 27

31. Straw-Sludge Manure. By F. H. Ransome. P. 525.

E — *Engineering News-Record*

November 16

18. *p.* Notes on Industrial Waste Treatment. Abstracts of papers before the F. S. W. A. Pp. 93-96.

G — *Water Works and Sewerage*

November

31. Municipalities Can Finance Improvements If They Try. By W. F. Tempest. Pp. 383-387.
32. Importance of Sewage Plant Operating Records. By H. T. Rudgal. Pp. 393-397.
33. A Temporary Hypo-Chlorinator for $5. By J. R. Snell. Pp. 404-405.

H — *Sewage Works Engineering*

November

46. Sludge Concentration and Barging at Joint Meeting Plant. By W. Rudolfs. Pp. 566-567.
47. Use of Sludge as a Fertilizing and Soil Conditioning Agent. Pp. 581-582.
48. Interstate Sanitation District Requires $120,000,000. By Seth Hess. Pp. 568-570.

J — *American City*

November

17. Sewage and Refuse Handling Combined. By Norman W. Wagner. Pp. 59-61.

M — *Water and Sewage*

September

10. Activated Sludge Operating Costs. By W. M. Veitch. Pp. 19-21, 48.
11. Sewage Treatment for Port Hope. By G. Graham Reid. Pp. 22-23.
12. *p.* Operating a Sewerage System. By F. S. Adamson. Pp. 27, 52.
13. Manitoba's Sewage Requirements. By J. Foggie. Pp. 28, 48.

P — *Public Works*

November

49. San Bernardino Sewage Disposal Plant Enlargement. By Bard D. Livingstone. Pp. 16-17.
50. Bypassing a Difficult Sewer Construction Job. By E. A. Roberts. Pp. 22-23, 30.
51. Waterborne Disposal of House Refuse. P. 30.
52. *n.* Chicago's Refuse Disposal Problem. P. 32.
53. Planning High-Rate Filters. Pp. 36, 38.
54. *n.* Flooding Damage Due to Sewer Trench. P. 41.

X — *Journal, Western Society of Engineers*

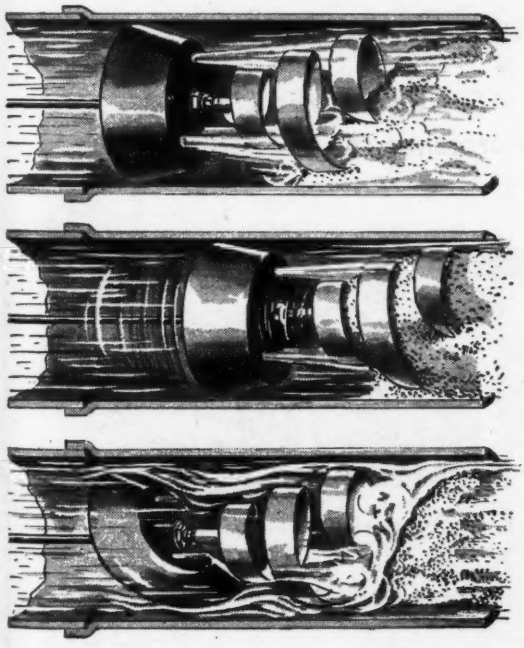
September

6. Controlled Garbage Digestion. Harry E. Schlenz. Pp. 273-278.

California Water District Must Pay Taxes on Its Real Estate Outside Its Boundaries

A metropolitan water district in California, the membership of which consisted of certain municipalities and a municipal water district, was organized for the purpose of collecting, storing and distributing water for domestic and municipal uses, for which purpose it owned real estate outside its boundaries. In an action to recover taxes levied on such real estate and paid under protest, it was held that this real estate was subject to taxation, the water district being a "municipal corporation" within the California constitutional amendment under which the property of a municipal corporation located outside of the municipal corporation is subject to taxation. Metropolitan Water District of Southern California v. Riverside County, California Supreme Court, 134, P. 2d 249.

"FLEXIBLES" + WATER PRESSURE



CLEAN SEWER PIPE!

ACTION NO. 1 WATER JETS WASH AWAY SAND
The head pressure of water in the manhole causes the water to jet through the holes in the Rubber Cup. This water levels off ahead and washes away loose sand during the whole cleaning operation.

ACTION NO. 2 LIKE A CORKSCREW, IT BORES IN
Powered by Flexible Rods, the auger bores in, loosening the sand or cutting roots while the water continues to spurt through holes in cup. The line being cleaned must be partially free flowing because this method depends entirely upon the head pressure to force the loose materials down the line.

ACTION NO. 3 RELEASING WATER PRESSURE
A pull back collapses the cup and releases a greater volume of water when the water level in the manhole rises too fast. This also serves to wash the sand or obstructions faster. Write today for illustrated catalog showing the various types of Flexible equipment.

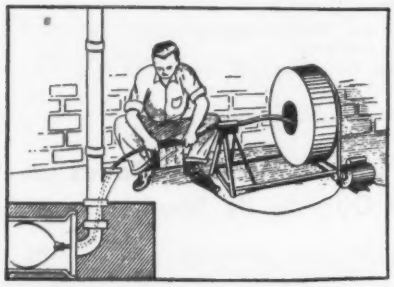
615 Pickwick Bldg. Kansas City 6, Mo.
1624 Harmon Place Minneapolis 3, Minn.
P. O. Box 694 Gulfport, Miss.
41 Greenway St, Hamden, Conn.

FLEXIBLE SEWER-ROD EQUIPMENT COMPANY
9059 Venice Boulevard Los Angeles 34, California

401 Broadway New York 13, N.Y.
2645 E. 75th St. Chicago 49, Ill.
P. O. Box 694 Pittsburgh, Pa.
P. O. Box 165 Atlanta, Georgia

When writing, we will appreciate your mentioning PUBLIC WORKS

Keeping Up With New Equipment



Spartan Electric Sewer Machine.

Spartan Electric Sewer Machine

Spartan Tool Company
6007 North Lincoln Avenue
Chicago 45, Illinois

The Spartan Electric Sewer Machine is especially designed for cleaning lines from basements to sewers in the streets. It consists of a cable made of music wire which, when not in use, is coiled in an enclosed drum. Cutting blades of 2 inch, 3 inch, 4 inch and 6 inch are attached, depending upon the size of the drain to be cleaned. A quarter hp. electric motor spins the cable thus revolving the cutters at high speed. The blades are attached directly to the end of the cable giving a flexibility and enabling the operator to pass the blades through sharp bends or elbows in the pipe line. The assembly weighs 130 lbs. and can be carried in the trunk of any passenger automobile. Write the manufacturer for a folder giving all information.

Tachometers for Chemical Feeders

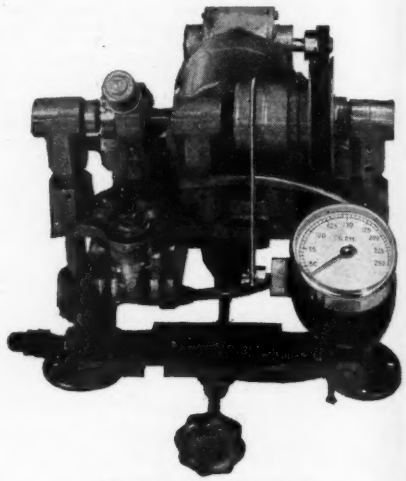
Chem-Feeds, Inc.
77 Reservoir Ave.
Providence, R. I.

An important improvement in chemical feeders, it is claimed, is a Tachometer used in conjunction with Variable Speed control on reagent pumps.

Variable Speed Pulley drive was first applied to hypochlorinators and small chemical feeders in 1943 by Chem-Feeds, Inc. This firm says it originated small High-stroking-speed chemical pumps with Finger-Tip Control of delivery while unit was in motion, by means of variable-pitch-pulley drive.

About "D-Day" the Tachometer was applied by Chem-Feeds, Inc. to chemical dosing devices, furnished to many of its customers.

Chem-Feeds, says "Solution feeding basically is a sequence of measured displacements of a liquid. Control of this feed requires accurate counting of these 'shots' plus easy means of regulating the number of injections made. No arbitrary scale nor approximation is as correct as the actual 'counting off' of the volumetric units fed, especially if the counting is done at the displace-



Chem-Feeds Tachometer.

THE SEWER SCOOTER

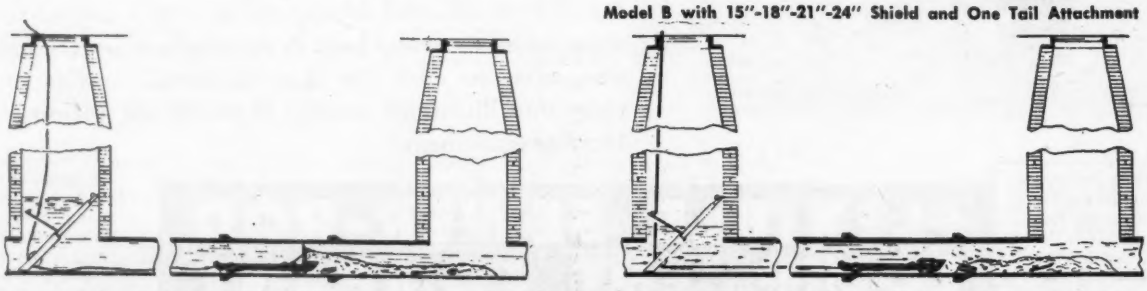
THE ONLY 100% SELF-PROPELLING SEWER CLEANING MACHINE

Model A-3 with 8"-10"-12" Shield

Sewage in the Line Furnishes the Propelling Power

Your sewerage system need not suffer from the manpower shortage. Your maintenance crew can restore all lines to full capacity with the use of this sanitary and economical method. It needs only a small crew to handle it and *reduces cleaning time 75% to 80%.*

Model B with 15"-18"-21"-24" Shield and One Tail Attachment



J. C. FITZGERALD, P. O. BOX 289, Coral Gables 34, Florida

ment pump piston where it is beyond errors due to belt slip, motor slow down, voltage fluctuation or other variables of a mechanical drive. Most chemical feeder designs to date attempted control by adjustment of stroke length of displacement piston or diaphragm. Difficulty of accurately dividing a short stroke length (say ¼ inch) into many increments is obvious. To divide 300 constant length strokes per minute into many divisions is easy and accurate with Tachometer control."

"The Tachometer is to the chemical feeder what your Speedometer is to the auto. You step on the car accelerator till speedometer shows the desired speed—or you adjust the handweel of Var-1-Feeder control till Tachometer indicates the speed-&-feed wanted."

Two New Post-War Planning Folders

"Suggestions and Useful Data for the Better Community You Are Planning" *"Suggestions and Useful Data for Those Modern Roads You Are Planning."*

The folders are similar in content but the first is intended for municipal readers and the second for highway and other readers.

These folders catalog briefly the problems confronting engineers and officials in connection with post-war plans and construction. Suitable Armco products for meeting these problems are illustrated, along with brief descriptions, advantages and available design literature.

Copies of the folders may be obtained from Armco Drainage Products Association, Middletown, Ohio.

Newark-Made Chlorinators Among First to Purify Water for Yanks in France

With American Forces in France—Four Chlorinators, products of Wallace and Tiernan Company, Newark, New Jersey, were among the first equipment other than weapons in operation on the bullet-swept beaches of Normandy.

Soon after reconnaissance squads of the Engineer Combat Batttalion charged with the mission of purifying water had located a small stream, the Newark-built machinery was in operation.

Serial numbers M5907-T, L12181-T, M5115-T, and L968-T, the Chlorinators—named Sally, Marian, Kathryn and Sue, after the soldier-operators' wives—pump 15 gallons of unpurified water per minute, adding soda ash, alum, calcium hypochlorite and other chemicals.

The average American soldier consumes at least a one-quart canteen of water each day.

Through the chlorinators the water passes into filter machines also built by the Newark concern. Here the water filters through 15 different sizes of sand and gravel.

The filter machines are those stamped with Wallace & Tiernan serial numbers M6109-F, F6490-F, M6108-F, and L12152-F, and set a purified water production record of 40,000 gallons a day.

Etnyre "Black-Toppers" Shipped by Air Through Ingenuity of U. S. Corps of Engineers

The story starts back several months ago, when officers in the U. S. Corps of Engineers, knowing the critical need for bituminous distributors to hurry the construction of air fields and access roads to battlefronts, determined to experiment with air delivery of Etnyre "Black-Toppers." In cooperation with Etnyre engineers, the problem was finally solved by disassembling each complete distributor sufficiently to fit into three plane loads, then reassembling it when it reached its destination.

Once the solution had been reached, fast action was demanded, with delivery of the first twenty-six units scheduled for less than three weeks. In that time Etnyre not only made the "Black-Toppers," but also published a complete instruction booklet to show cargo plane loaders how to disassemble and reassemble the distributors.

Filtros Plates

In a 12-page folder, issued by Filtros Incorporated, East Rochester, N. Y. describes Filtros as artificial stone with practically uniform struc-

SINCE 1890

"SOMEWHERE IN ENGLAND"

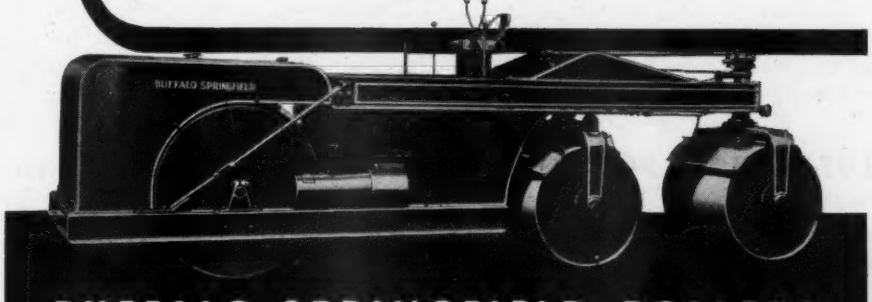
Ever since men now old were young, Buffalo-Springfield rollers have been "old reliables" in the field of road construction. No other make can match them for low cost of maintenance over the years—in peace or in war.

Soon still more efficient models will appear on The Buffalo-Springfield line, ready to chalk up still higher performance figures—still lower maintenance costs.

Stand by for announcements.

THE BUFFALO-SPRINGFIELD ROLLER CO.

SPRINGFIELD, OHIO.



BUFFALO-SPRINGFIELD ROLLERS

ture throughout and analagous to a mass of capillary tubes, which take a tortuous rather than a direct path through the ware. Detailed information is included on method of installing Filtros plates with drawings and the importance of maintaining uniform permeability and an accurate method of determining the amount of air that would pass through an aerating or diffusing plate, is explained. Copies of the booklet are available upon request.

Gas Holder Inspection Service Line

Stacey Bros. Gas Construction Co.
5535 Vine Street
Cincinnati 16, Ohio

In a 16-page bulletin the company explains where corrosion usually develops and illustrates them. The results of inadequate inspection and maintenance are pointed out and how to control corrosion in Wet Seal Gas Holders is explained. In the following pages Stacey Bros. inspection service is fully explained. Copies of this bulletin are available upon request.

Dresser Industries Acquires International Stacey Corp.

Oscar M. Havekotte of Columbus, Ohio, has been elected a director of Dresser Industries, Inc. Mr. Havekotte, for the past four years president of International-Stacey Corporation and of International Derrick and Equipment Company, both Columbus concerns, will continue as head of the latter company.

The acquisition of International-Stacey Corporation gives Dresser Industries, Inc., a leading position among manufacturers of equipment for the gas and water fields. The 10 companies now comprising the Dresser group manufacture a completely rounded line of products, from pipe couplings to large pumps, blowers and compressors.

As International-Stacey winds up its corporate affairs, its factories and those of its subsidiary companies will continue in full operation, without change of local managements. International Derrick & Equipment Co., Roots-Connersville Blower Corp. and Stacey Bros. Gas Construction Co. become new units in the Dresser group, each continuing to operate under their own names.

Dresser Industries, Inc., Cleveland, Ohio now embraces Dresser Manufacturing Division, Bradford, Pa.; The Bryant Heater Co., Cleveland, Ohio; Clark Bros. Co., Inc., Olean, N. Y.; Pacific Pumps, Inc., Huntington Park, Calif.; International Derrick & Equipment Co., Columbus, Ohio, Delaware, Ohio, Marietta, Ohio, Beaumont, Texas, Torrance, Calif.; Roots-Connersville Blower Corp., Connersville, Ind.; Stacey Bros. Gas Construction Co., Cincinnati, Ohio; Bovaird & Seyfang Mfg. Co., Bradford, Pa.; Dresser Mfg. Co., Ltd., Toronto,, Ont.; Van der Horst Corp. of America, Olean, N. Y., Cleveland Ohio.

Sewage Samplers

Infilco Incorporated
325 West 25th Place
Chicago 16, Ill.

In this folder a detailed description of an accurate sampler made by this company and its advantage over hand sampling is explained. Specifications for sampling are also included in the folder. Copies may be had by writing to Infilco, Inc.

Transfers Local Managers

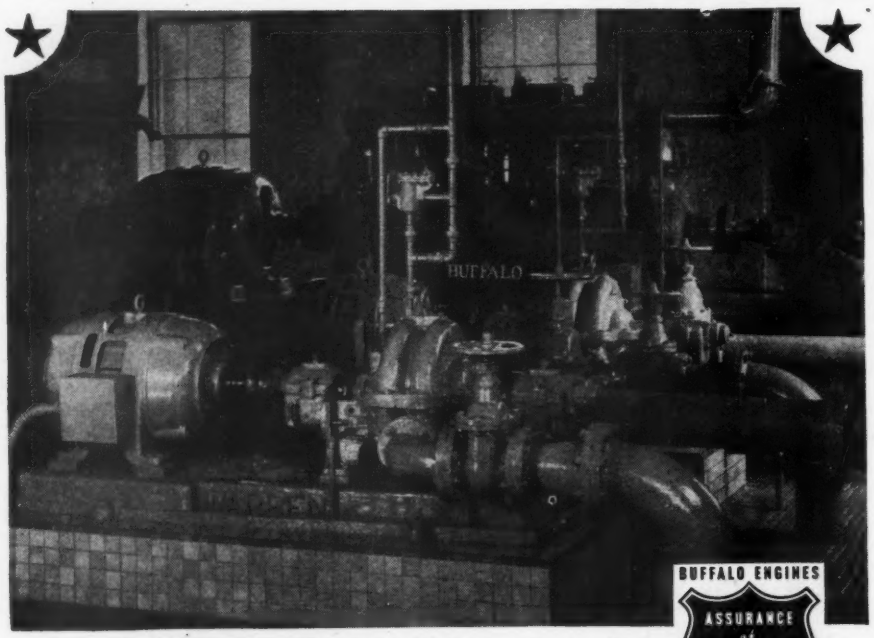
The Dorr Company
570 Lexington Avenue
New York 22, N. Y.

Important appointments in the Sanitary Engineering Division of the Dorr Company have been made to keep pace with post-war planning activities and to use the limited staff to best advantage.

Fred G. Nelson, Assistant Manager of the Division, has been transferred to Los Angeles and appointed Manager of the Western Territory. O. V. Lindell has been transferred from Kansas City to Chicago and appointed Manager of the Central Territory. The office in Kansas City will continue to serve the Southwest. W. A. Darby continues as Manager of the Eastern Territory.

Le Roi Appoints New Compressor Sales Manager

Le Roi Company—Milwaukee, Wis., manufacturers of portable air compressors, internal combustion engines, and engine-driven generator sets announces



Installation of BUFFALO Model RA-8 at Centerville-Osterville Fire District, Cape Cod, Mass.

Make room TO GROW IN

When laying out an installation, it's good practice not only to plan space for stand-by motor generator or pumping sets, but also to let there be room for the added equipment that future growth may demand. Ask any operating man whose motors are crowded in a narrow space between walls.

However, if the stand-by motor is a BUFFALO, things are not too bad. Years of designing motors for this service has resulted in their being most conveniently arranged for inspection and maintenance of wearing parts. Starting can be either manual, remote, or full automatic.

And the big point about Buffalo engines is their unfailing reliability—recognizable from a reading of their specifications and proven by years of service.

Engineers are invited to write for Specification Sheets for their files and to request any information that our experience in varied installations may afford.

BUFFALO GASOLENE MOTOR COMPANY BUFFALO ENGINES
PW-124 BUFFALO 13, N. Y., U. S. A. ASSURANCE of PROTECTION

BUFFALO ENGINES — 100 H. P. THROUGH 750 H. P.— IN GENERATOR AND PUMPING SETS FOR WATER WORKS — AIRPORTS — COMMUNICATIONS — FLOOD CONTROL — HOSPITALS — INSTITUTIONS — MINES — MOVABLE BRIDGES — THEATRES — SEWAGE PLANTS.

When writing, we will appreciate your mentioning **PUBLIC WORKS**

Norman M. Sedgwick

The appointment and advancement of Norman M. Sedgwick from Assistant Manager of Compressor Sales to Sales Manager of that division succeeding Donald (Don) Heffron, who has resigned to take up another line of work.

Having been active in compressor sales work for more than eight years, Mr. Sedgwick is no newcomer to the field. He is well-known among general contractors, government agencies, equipment distributor organizations, and hundreds of compressor users. His thorough knowledge of portable air compressor equipment, his understanding of distribution problems, plus an outstanding ability in the successful handling of responsible assignments, all point to a continued advance of Le Roi Company in the compressor industry.

Schoonfield Made Branch Manager for Gar Wood Industries, Inc.

Roy Schoonfield has been made Acting Manager of the Washington Branch by W. H. Hammond, Vice-President and Director of Branches. Schoonfield succeeds A. E. Heath, who has been assigned to other duties with the Corporation.

Billmyre Appoints Johnson & Scott

Allen Billmyre Company of Mamaroneck, N. Y., has appointed Johnson & Scott, 918 Dermon Building, Memphis 3, Tenn. as their representatives for Tenn. They will handle the sales of Billmyre Turbo Blowers and Exhausters, Pottstown Rotary Blowers and Exhausters, Exidust Industrial Vacuum Cleaning Systems and Portable Vacuum Cleaners, and the other Allen Billmyre Products in this territory.

Michael Baker Jr. Organization Planning Post-War Developments for Lancaster, Pa.

Taking a step forward in the field of municipal development, the City of Lancaster, Pennsylvania, recently awarded a zoning and city planning contract to Michael Baker, Jr., Consulting Engineers, Planners, and Surveyors of Rochester, Pa.

With an office established in this Pennsylvania community which is more than 200 years old and rich in historical tradition, the Planning Division of the Baker Engineers is busily engaged in studying the physical, social, and economic conditions of this city.

Baker research technicians and planners, as well as their engineers, have as their definite objective the presentation of a practical plan of improvements and recommendations to the City Government for the immediate post-war period, and also for a long-range development program.

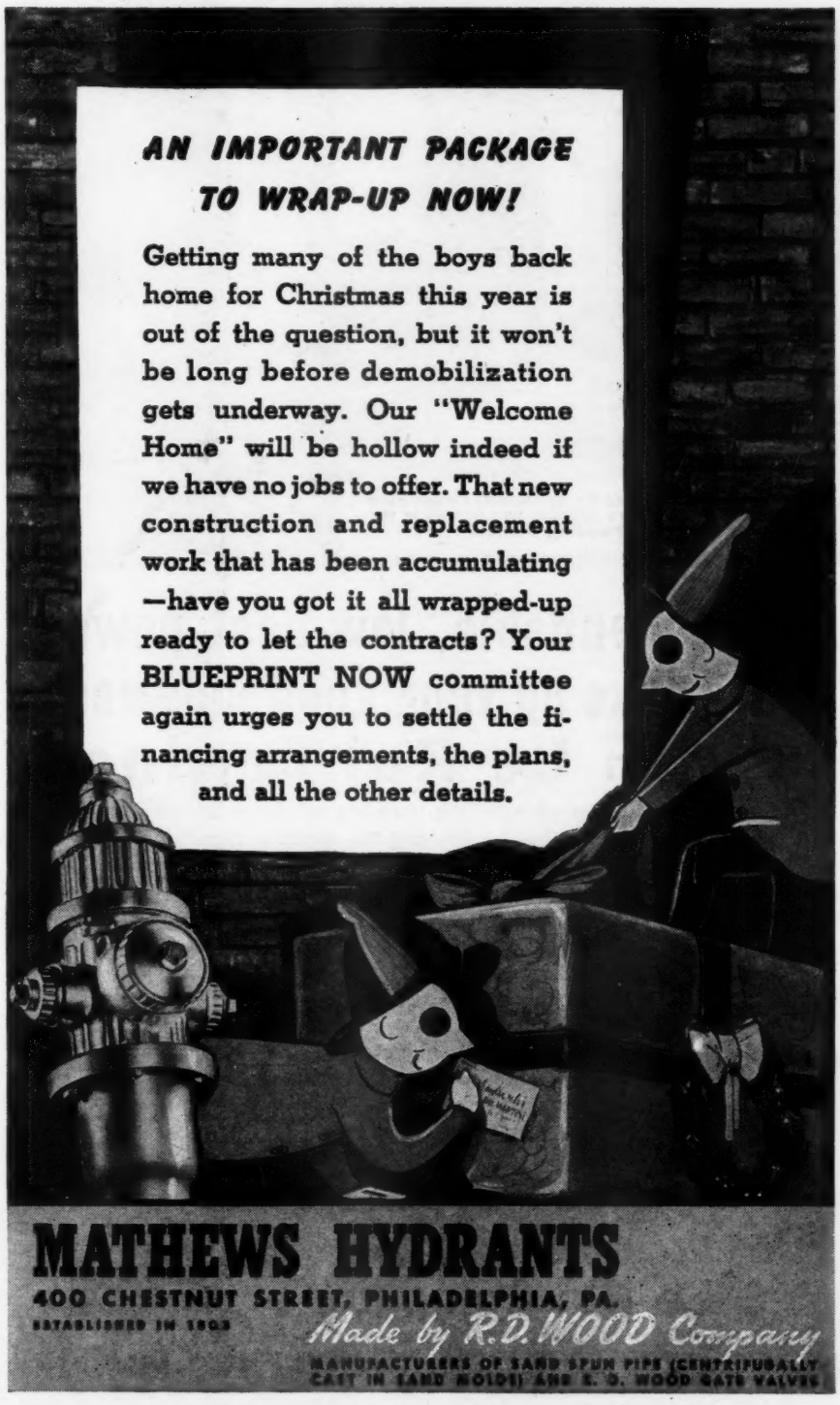
Oscar L. Grover Retires as Chief of Bridge Division, Public Roads Administration

Having reached statutory retirement age his retirement is announced by the Public Roads Administration of the Federal Works Agency. But Mr. Grover has been reappointed as special consultant on bridge and structual problems and will continue to serve the organization in planning post-war construction. His services with the Federal Government began in 1914 and he has been in charge of bridge design throughout the entire period of Federal-aid road construction.

Raymond Archibald, Principal Structural Engineer, has been appointed Chief of the Bridge Division. He has been with the Public Roads Administration since 1935 and was in charge of design and construction of bridges on the Alaska Highway.

Harold A. Stepleton Joins Floyd G. Browne & Associates

Mr. Stepleton, Consulting Sanitary


AN IMPORTANT PACKAGE
TO WRAP-UP NOW!
Getting many of the boys back home for Christmas this year is out of the question, but it won't be long before demobilization gets underway. Our "Welcome Home" will be hollow indeed if we have no jobs to offer. That new construction and replacement work that has been accumulating —have you got it all wrapped-up ready to let the contracts? Your BLUEPRINT NOW committee again urges you to settle the financing arrangements, the plans, and all the other details.
MATHEWS HYDRANTS
400 CHESTNUT STREET, PHILADELPHIA, PA.
ESTABLISHED IN 1803
Made by R.D. WOOD Company
MANUFACTURERS OF SAND SPUN PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES

Engineer of Toledo, Ohio, recently completed eighteen months work with the Engineering Faculty at the University of Toledo where he was in charge of the Physics Laboratory during the Air Cadet Training period.

He has now returned to private practice as a member of the staff of Floyd G. Browne and Associates, Marion, Ohio, Consulting Sanitary Engineers on water supply, sewage and industrial waste treatment.

A Second Star Awarded to Cleaver-Brooks

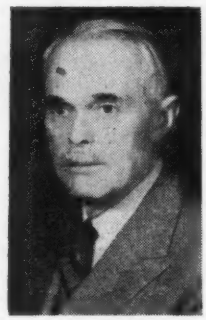
"A second white star has been added to the Army-Navy "E" flag at the Cleaver-Brooks Company, Milwaukee, Wisconsin. Conferred on October 19, 1944, this is the third time this company has won the Army-Navy Production Award for 'high achievement in the production of war material.' Cleaver-Brooks Company are manufacturers of steam generators and special mobile heating and distillation equipment for all branches of the armed forces."

Charles H. Becker

Charles H. Becker, Sales Manager of the Hydrant and Valve Department of the R. D. Wood Company, Philadelphia, Pa., died November 9th, after a long illness which confined him to the hospital for the past month.

Mr. Becker, who would have been fifty-one years old November 23rd, was well-known in the water works field. He had been associated with R. D. Wood Company since 1913 and for the past seventeen years was Manager of the Hydrant and Valve Department.

In addition to his position with R. D. Wood Company, he was a member and director of the American Water Works Association, and President of the Water and Sewage Works Manufacturers Association.



J. S. Bright

J. S. Bright Appointed Deputy Commissioner of Public Roads Administration

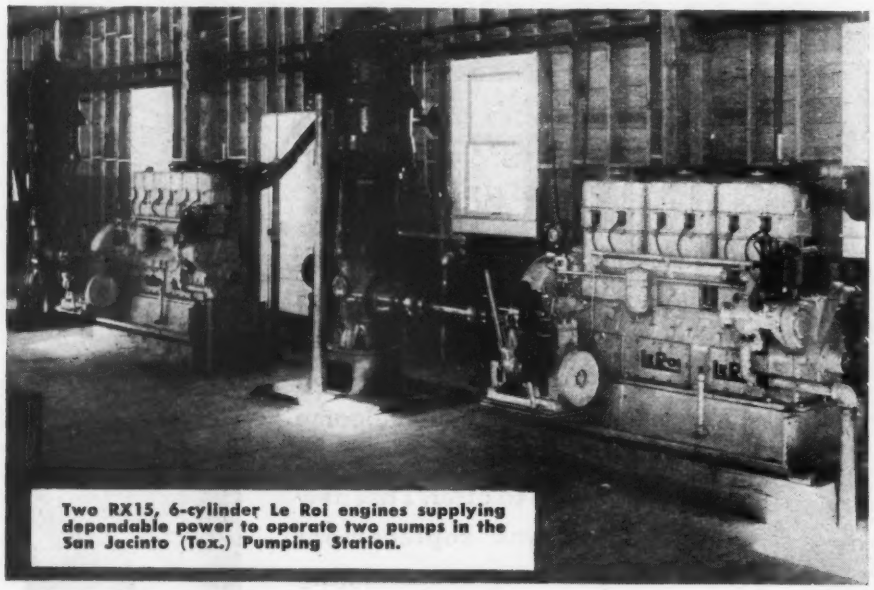
Appointment of J. S. Bright as Deputy Commissioner in charge of the Department of Construction and Maintenance of the Public Roads Administration is announced by Thomas H. MacDonald, Commisioner of Public Roads. Mr. Bright succeeds H. K. Bishop who has been in charge of construction and maintenance activity for many years. Mr. Bishop has reached retirement age.

Mr. Bright assumes his new duties with a wide experience in highway construction. In 1942 and 1943 he directed American and Canadian contractors working under the Public Roads Administration in the construction of the Alaska Highway.

He graduated in engineering at the University of California in 1901. From 1905 to 1917 he was employed by the San Bernardino County Highway Department, his last position being chief engineer. He was employed by the Public Roads Administration (then the Office of Public Roads) in 1917 when the Federal-aid highway program was first launched. Since that time he has taken a prominent part in the highway work of the Federal Government, first in organizing and planning the program and later in administering large annual Federal-State construction programs.

Trick Polarizing Traffic Signs

A method for making light-polarizing traffic signs that are visible to night-driving motorists only when they are using the wrong headlights is the subject of a patent which was issued today to Polaroid Corporation, Cambridge, Mass. The traffic signs are designed for automobiles fitted with both a polarizing headlight system for coun-



Two RX15, 6-cylinder Le Roi engines supplying dependable power to operate two pumps in the San Jacinto (Tex.) Pumping Station.

For dependable, low-cost power that backs up your good judgment
***Insist on* Le Roi Engines**

Men who are responsible for the unfailing operation of municipal power plants know that Le Roi Engines perform dependably in both continuous and intermittent duty on many different types of jobs.

One of the main reasons why you can rely on Le Roi engines is the fact that they are built by a manufacturer *concentrating exclusively* on the problems of the heavy-duty field. They incorporate many quality features that give you more H.P. hours per dollar.

When you specify Le Roi engines, your recommendation is backed by many years of experience in the specialized power requirements of your particular field.

Write for complete information.

2 to 12 cylinders • 4 to 400 H.P.
Use Natural Gas, Gasoline, or Butane

Le Roi Company
1770 South 68th St. • Milwaukee 14, Wisconsin
ENGINES • PORTABLE AIR COMPRESSORS • ENGINE-GENERATORS

LE ROI

When writing, we will appreciate your mentioning **PUBLIC WORKS**

try driving and an ordinary headlight system for city driving.

The novel warnings, "Shift to polarized beam" and "Shift to unpolarized beam" would be visible to the driver when he uses the wrong headlight system required for the area in which he is driving. However, the warnings would be invisible when he uses the right system.

Snell Adds to Staff

Foster D. Snell, Inc.
305 Washington St.
Brooklyn 1, New York

Bernard Berkowitz, recent graduate, Frank Celauro, formerly with American Cynamid Co., and Dorothy Polizzi, recently with the Matam Corporation, now assigned to the Analytical Department; Helen Friedman and Marcel Grauer, formerly at the Brooklyn Navy Yard and at Neo Smelting and Refining Company respectively, at present assigned to the Physical Chemistry Department; Walter S. Lui, Chemist with the Federal Government for several years, is engaged in experimental work; William Palmigiano, previously at Cornell Medical College, is Superintendent of the Laboratories; Daniel Schoenholz, for several years with the Chemical Warfare Service is now group leader of the Development Division, with Yetta Levine, formerly of Casco Company and John Swidinsky, recent chemist at Calco Chemical Co., as assistants; Albert M. Stover, for 3 years a research chemist at the B. F. Goodrich Company and Ellen Schuster, recent graduate, currently doing research in the Rubber and Plastics Department.

Asphalt Institute Establishes Billings, Montana, Office—Appoints John R. Banning, District Engineer

The Asphalt Institute
801 Second Avenue
New York 17, N. Y.

Bernard E. Gray, General Manager of The Asphalt Institute, has announced the appointment of John R. Banning as District Engineer for the territory comprising Montana, Eastern Washington, Idaho, Wyoming, North Dakota, Western South Dakota and Utah, with office in the Gullard and Wilkins Building, Billings, Montana.

Mr. Banning's engineering experience, extending over the past twenty-one years, began in the engineering department of the City and County of Denver in 1923. There he served successively as laboratory technician, office engineer and Assistant Superintendent of the Paving Division, resigning in 1933 to become Project Engineer for the U. S. Bureau of Public Roads in charge of the construction of the North-East entrance to Yellowstone Park, and the bituminous mat construction on the Canyon-Tower Falls highway over Dunraven Pass.

Mr. Banning is now available and equipped to extend the engineering, research and general promotional facilities of The Asphalt Institute to highway, airport and other public works officials of Federal, State, Municipal, County and Town agencies.

The Navy Renews the "E" Award to the Stacey Brothers Gas Construction Company

In extending the award Admiral C. C. Block wrote "The men and women of the Stacey Brothers Gas Construction Company have achieved this high honor by continuing their splendid production in such volume as to justify this renewal of their award. In the first instance it was difficult to win the Army-Navy "E" and by meriting a renewal, the management and employees have indicated their determination and ability to support our fighting forces by supplying the equipment necessary for ultimate victory."

"The Navy Department extends its hearty congratulations and desires to express a fervent hope that future production will be even more outstanding."

Ben Crabbe Back With Hydraulic

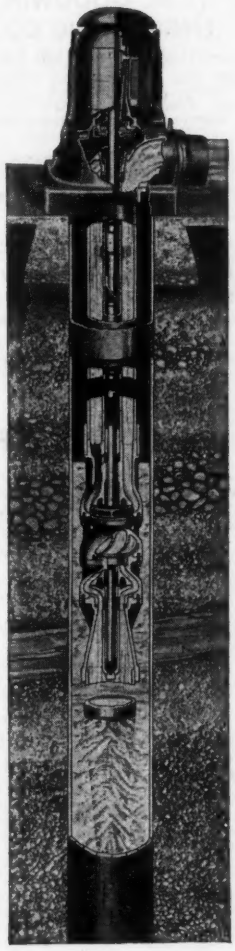
Ben F. Crabbe, of Birmingham, Ala., who for many years has sold HYDRO-TITE and FIBREX in the Southeast-

(Continued on page 66)

PUMPING WATER

"the economical way"

With Peerless Turbine Pumps



The indisputable *economy of operation*, that is peculiarly a *Peerless feature*, is not just a happenstance. The ingenuity of top-notch engineers, the unusual skill of precision-minded, highly-trained pump building mechanics working with *better materials*, plus years of painstaking laboratory and field tests alone were the factors responsible for not only the marked economy, higher sustained efficiency and greater dependability of every Peerless pump, but also the fact that Peerless products are from the factories of the world's largest manufacturer of deep well Turbine pumps.

Experienced Pump Engineers to assist you

The Peerless Pump Distribution Organization, a member of which will be found in your near neighborhood, is composed of the most efficient and dependable pump men in the country today. Cooperating with our own factory-trained field engineers, they stand ready to offer you all of their wide experience and skill.

PEERLESS PUMPS

PEERLESS PUMP DIVISION
Food Machinery Corporation

TURBINE
HI-LIFT
HYDRO-FOIL

301 W. Ave. 26, Los Angeles 31, Calif. • 1250 Camden Ave. S.W., Canton 6, Ohio • *Other Factories:* San Jose 5, Fresno 16, Calif.

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 67-69*

DIRECTORY OF CONSULTING ENGINEERS

ALBRIGHT & FRIEL, Inc.
Consulting Engineers
WATER, SEWERAGE, INDUSTRIAL WASTE, GARBAGE, POWER PLANT AND VALUATION PROBLEMS
1520 Locust St. Philadelphia, Penna.

Charles B. Burdick Louis R. Howson
Donald H. Maxwell
ALVORD, BURDICK & HOWSON
Engineers
Water Works, Water Purification, Flood Relief, Sewerage, Sewage Disposal, Drainage, Appraisals, Power Generation
Civic Opera Building Chicago

BLACK & VEATCH
Consulting Engineers
Sewerage, Sewage Disposal, Water Supply, Water Purification, Electric Lighting, Power Plants, Valuations, Special Investigations, Reports and Laboratory Service
E. B. Black N. T. Veatch, Jr.
A. P. Learned H. F. Lutz
F. M. Veatch J. F. Brown
E. L. Filby
4706 Broadway Kansas City, Missouri

CLINTON L. BOGERT
Consulting Engineer
WATER SUPPLY AND TREATMENT
SEWERAGE AND SEWAGE TREATMENT
624 Madison Avenue
New York, 22, New York

BUCK, SEIFERT AND JOST
Consulting Engineers
(FORMERLY NICHOLAS S. HILL ASSOCIATES)
Water Supply Sewage Disposal
Hydraulic Developments
Reports Investigations, Valuations, Rates, Design, Construction, Operation Management, Chemical and Biological Laboratories
112 East 19th St. New York City

JAMES M. CAIRD
Assoc. Am. Soc. C. E.
Chemist and Bacteriologist
Water Analysts and Tests of Filter Plants
Office and Laboratory
Cannon Bldg., Broadway & 2nd St.
Troy, N. Y.

THE CHESTER ENGINEERS
CAMPBELL, DAVIS & BANKSON
Water Supply and Purification
Sewerage and Sewage Treatment
Power Developments and Applications
Investigations and Reports
Valuations and Rates
210 E. Park Way at Sandusky
Pittsburgh 12, Pa.

CHAS. W. COLE & SON
Consulting Engineers
Sewerage, Sewage Treatment, Industrial Wastes, Water Supply, Water Treatment, Airports, Industrial Buildings
Design and Supervision
Chas. W. Cole, Sr. Chas. W. Cole, Jr.
Ralph J. Bushee M. J. McErlain
Wilbur H. Gartner
220 W. LaSalle South Bend, Ind.

CONSULTING ENGINEERS
Your professional card belongs in this directory of leading engineer specialists, where it will be seen by those who employ consultants. For rates, write: PUBLIC WORKS, 310 East 45th St., New York 17, N. Y.

A. W. DOW, Inc.
Chemical Engineers
Consulting Paving Engineers
Mem. Am. Insti. Ch. Engrs.
Asphalt, Bitumens, Tars, Waterproofing, Paving, Engineering, Materials
901 Second Avenue New York

WILLIAM A. GOFF
Consulting Engineer
Private and Municipal Engineering
Sewerage, Sewage Disposal
Water Supply and Treatment
Garbage, Refuse, Industrial Wastes
Design, Supervision, Valuations, Reports
Broad St. Station Bldg. Philadelphia

J. W. GOODWIN ENGINEERING CO.
Municipal and Consulting Engineers
Design and Construction Supervision
Air Ports, Waterworks, Sewerage, Sewage Treatment, Water Treatment, Gas Systems, Street Improvements, Reports, Appraisals
Birmingham, Alabama

GREELEY AND HANSEN
Engineers
Samuel A. Greeley Paul Hansen
Paul E. Langdon Kenneth V. Hill
Thomas M. Niles Samuel M. Clarke
Water Supply, Water Purification, Sewerage, Sewage Treatment, Flood Control, Drainage, Refuse Disposal
6 N. Michigan Ave. Chicago 2
299 Broadway New York 7

HOWARD R. GREEN CO.
Consulting Engineers
DESIGN AND SUPERVISION OF MUNICIPAL DEVELOPMENTS
Water Works and Treatment—Sewers and Sewage Disposal—Investigations and Valuations
208-10 Bever Bldg., Cedar Rapids, Iowa
Established 1913

HILL AND HILL
SANITARY AND MUNICIPAL ENGINEERS
Water Filtration Water Supply
Dams and Reservoirs Sewage Disposal
Tunnels and Drainage Sewer Systems
Topographic Maps and Surveys
Home Office: 24 E. Main St., North East, Pa.

WM. S. LOZIER, INC.
Consulting Engineers
Wm. S. Lozier C. E. Elmendorf
A. B. Squire
Sewerage, Sewage Disposal, Water Supply, Water Purification, Refuse Disposal
10 Gibbs Street Rochester, N. Y.

MICHAEL BAKER, JR.
The Baker Engineers
CIVIL ENGINEERS—PLANNERS—SURVEYORS—MUNICIPAL ENGINEERS
Airport Design • Sewage Disposal Systems • Water Works Design & Operation
Consulting Services • Surveys and Maps
HOME OFFICE — ROCHESTER, PA.
San Antonio—Omaha—Philadelphia—Pittsburgh—Harrisburg—Atlanta—Anchorage, Alaska

S. F. FERGUSON
Water Leak Surveys *Distribution Maps*
11 HILL STREET, NEWARK 2, N. J.

ROBERT AND COMPANY
INCORPORATED
Architects and Engineers
Water Supply
Sewage Disposal
ATLANTA, GEORGIA
Incinerators
Power Plants

Enroll in a Refresher Course in
MUNICIPAL PUBLIC WORKS ADMINISTRATION
This course given by correspondence is designed to acquaint public works directors and city engineers with the organization and management of their departments. Personnel, planning, equipment, measurement, records, reports, and public relations are emphasized.
INSTITUTE FOR TRAINING IN MUNICIPAL ADMINISTRATION
1313 EAST 60th STREET, CHICAGO, 37

GANNETT FLEMING CORDDRY AND CARPENTER, Inc.
HARRISBURG, PENNSYLVANIA
ENGINEERS
Preparation of Post War Reports and Plans

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 67-69*

CONSULTING ENGINEERS

(Continued from page 64)

METCALF & EDDY
Engineers
Water, Sewage, Drainage, Refuse and Industrial Wastes Problems
Airfields Valuations
Laboratory
Statler Building Boston 16

MALCOLM PIRNIE
Engineer
Water Supply, Treatment, Sewerage
Reports, Plans, Estimates,
Supervision and Operation,
Valuation and Rates
25 W. 43d St. New York, N. Y.

RUSSELL & AXON
Geo. S. Russell—John C. Pritchard
Joe Williamson, Jr.—F. E. Wenger
Consulting Engineers, Inc.
Sewerage, Sewage Disposal, Water Works, Filtration, Softening, Power Plants
4903 Delmar Blvd. St. Louis, Mo.

J. E. SIRRINE & COMPANY
Engineers
Water Supply & Purification
Sewage & Industrial Waste Disposal
Stream Pollution Reports
Utilities, Analyses
Greenville South Carolina

FOSTER D. SNELL, Inc.
An organization of 30 chemists and engineers having laboratories for bacteriology, analyses, research and Physical testing rendering
Every Form of Chemical Service
Disposal of sanitary and industrial waste. Water supply and purification Consultation
305 Washington St. Brooklyn, N. Y.

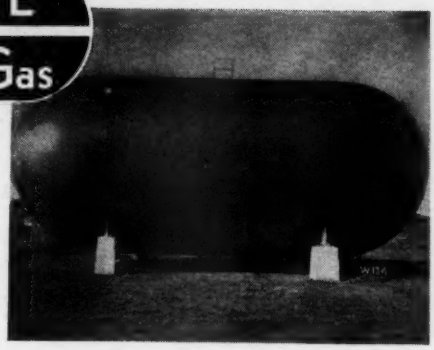
STANLEY ENGINEERING COMPANY
Consulting Engineers
Airports-Drainage
Electric Power—Waterworks
Sewerage—Valuations—Rate Studies
Municipal Buildings
Central State Bank Bldg. Muscatine, Ia.

CONVENTIONS

Jan. 16-19, 1945 . . . The 42nd Annual Meeting of the American Road Builders' Association, Stevens Hotel, Chicago. Plans for launching the greatest highway program in history will be considered from every angle.

CLOSE-OUT Sale! **GOVERNMENT SURPLUS OF ALBUM SCRAP-BOOKS**
Custom-Built for U.S. Army Air Force
GIANT SIZE! Dozens of uses in every office! Paste up advertisements, clippings, photos, samples, etc., etc. Size 26x26 inches. Heavy lifetime covers with reinforced leather corners. 3 adjustable metal binding posts, 100 black loose-leaf pages. Amazing Value—Only $15 each while they last! Send check with order. Money back if not satisfied.
Ask for illustrated price list of Album-Scrap Books in smaller sizes
SAMUEL K. UNGER, 3 East 14th St., New York 3, N.Y.

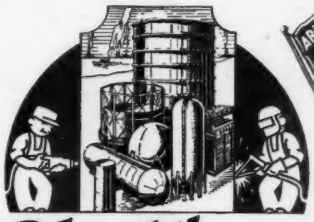
DON'T WASTE
Sewage Digester Gas



Sewage gas is a real cost-cutter; the most economical source of power and heat available for use in operating sewage treatment plant equipment. For a continuous supply, sewage gas is usually stored in tanks or holders during periods of peak production for use when production is low. Stacey Brothers are one of the world's foremost and oldest designers and producers of gas storage equipment in any capacity — large or small. Let us figure on your post-war requirements.

Photo shows a Stacey Brothers "Bullet" type high pressure gas tank. In addition to requiring less space and being unobtrusive in appearance, the comparatively low height of this horizontal gas storage tank makes for lower cost construction, erection, and maintenance.

The STACEY BROS. Gas Construction Co.
One of the Dresser Industries
5535 Vine St. Cincinnati 16, Ohio



ARMY-NAVY (E)

SECOND CITATION
Our outstanding war material production record has again been recognized by the awarding of a Star for our "E" Flag.

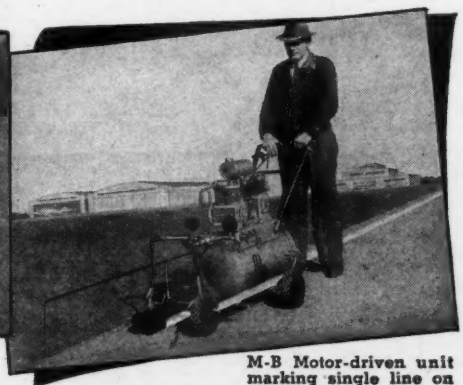
Stacey Brothers
Gas Storage
TANKS
ENGINEERS • FABRICATORS • RECOGNIZED EXPERIENCE & FACILITIES

SAFETY on the Home Front

M-B Motorless Marker striping factory aisle.

Reduce accidents to a minimum, both indoors and outdoors, by systematically striping designated traffic lanes. M-B MARKERS simplify the job. They handle ANY type of striping job — factory aisles, street centerlines, crosswalks, etc. Also handy for marking airports, athletic fields, tennis courts, playgrounds, etc. Quickly convertible to all-purpose paint sprayer for painting park benches, guard rails, traffic signs and other municipal equipment. Two types — motor driven for all-purpose painting and motorless for striping only. Write for literature.
Meili-Blumberg Corp., Box PW-12, New Holstein, Wis.

M-B Motor-driven Marker putting down double line at street intersection.



M-B Motor-driven unit marking single line on airport runway.

MB MARKERS

A 4365-⅓

Ben F. Crabbe

Fleming

ern area, and whose resignation was recently announced, is now back with Hydraulic Development Corporation. His former territory included Ala., Ga., Miss., and Tenn. In the future, in addition to these states, he will cover Florida, maintaining a warehouse stock in Birmingham.

Fleming With Hydro-Tite

Hydraulic Development Corp. announces the appointment of Fleming, of Chicago to handle sales and distribution of HYDRO-TITE and FIBREX in the states of Ind., Ill., Wis., and Mich. Fleming maintains offices in the Engineering Bldg., 205 W. Wacker Drive, Chicago and is widely known in the municipal field.

New Flow Splitting Device

A new flow splitter, called the Micro-Rotaweir, is available to accurately divide a liquid flow into two streams. The proportions of the flow division may be varied at will by adjusting an outside lever and pointer to the percentage desired, as indicated by an external scale.

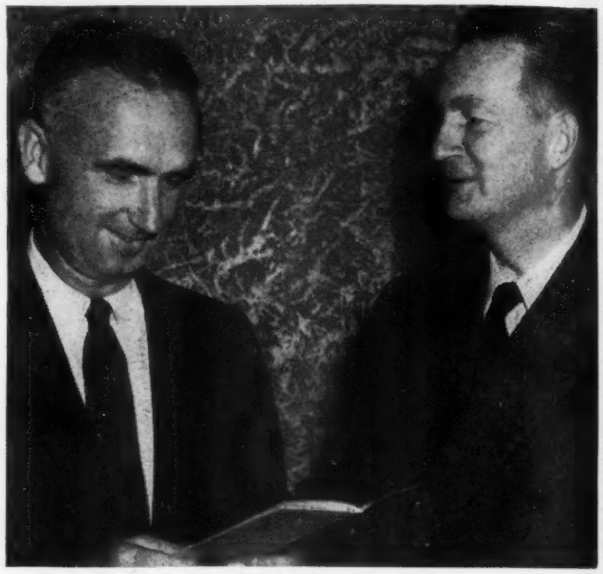
The operation of the Micro-Rotaweir is as folows: The inlet pipe comes in from the top and discharges the liquid into a receiving chamber which has a rectangular weir as an overflow. A vertical knife edge is set against the external edge of the weir, thus dividing the stream into two parts as it flows over the lip of the weir. One of the streams flows into a closed compartment with bottom outlet; the other stream spills into the area surrounding the receiving chamber and discharges also from the bottom. The receiving chamber is connected through a stuffing box at the bottom to an external lever by means of which the weir may be rotated to any position with respect to

(Continued on page 70)

Old Friends Meet at Water Convention

Kenneth W. Brown (at left) attending the 25th Annual Session of the American Water Works Association in Los Angeles last month, reminisces with his old friend Everett W. Lundy.

"Ken" is now consulting chemical engineer in San Francisco and was formerly chief chemist of the California Water Service Co. Lundy is Western Sales Manager for Peerless Pump Division of Food Machinery Corp. headquarters in Los Angeles.



Kenneth W. Brown and Everett W. Lundy.

As a First Step in Sewer Cleaning...

←**GET THIS BOOK TODAY**

Whatever the job to be done, there is a STEWART rod, tool, or piece of equipment for its best doing. The first step is to get the complete new STEWART catalog today.

Clogged, half-capacity sewers won't clean themselves. But STEWART sewer cleaning equipment enables you to do a fast thorough job with your own sewer forces.

All too often sewers that are not giving proper service are merely too choked to function properly. Clean them the STEWART way, with STEWART tools and equipment, and you restore their full capacity in the quickest and most economical manner.

ONE TYPE OF STEWART SEWER ROD

CONSERVE MANPOWER

In these days when sewer departments are woefully short handed, you can get the most from your limited man-power by using the right tools in the right way. Advising with sewer department heads about how to accomplish the most with the least is where we can help. Just address, without obligation:

HAVE YOU "WPA" SEWERS?

If so, many of them are now old enough to need their first cleaning. Why not get off on the right foot by first consulting STEWART for full data and helpful suggestions?

W. H. STEWART
P. O. BOX 767 SYRACUSE, N. Y.
"Since 1901"

Readers' Service Department

These booklets are FREE but distribution is restricted to those actively engaged in engineering or construction. Use the coupon or write the manufacturer direct, mentioning PUBLIC WORKS.

Construction Materials and Equipment

Airport Radio Traffic Control

5. "Highways of the Air" is a new and valuable booklet available for engineers and officials interested in radio traffic control for airports. Illustrated and non-technical. Address: Radio Receptor Co., Inc., 251 West 19th Street, New York 11, N. Y.

Cold Mix Plants

15. New catalogs and prices of Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, Ohio.

Cold or Wet Weather Construction

18. Cleaver Aggregate Heaters and Dryers, Hot Water Boosters, and Automatic Steam plants are designed to speed up cold or wet weather construction. Write for illustrated bulletins. Cleaver-Brooks Co., 3112 W. Center St., Milwaukee 9, Wis.

Concrete Accelerators

31. New 48-page booklet in five sections explains clearly the effects, advantages and methods of using Calcium Chloride and Portland Cement mixes. Complete and packed with practical information; well illustrated; pocket size. Sent free on request by Solvay Sales Corp., 40 Rector St., New York 6, N. Y.

Concrete Curing

33. 64-page manual of concrete curing with calcium chlorides. Complete, handy. Contains useful tables, well illustrated. Write the Columbia Chemical Division, Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh 19, Pa.

Concrete, Early Strength

38. 64-page manual tells how to speed up year 'round concreting, shows how to secure high early strength and greater workability at temperatures either below or above freezing. Contains many actual examples of practical concreting operations; well illustrated with more than 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit 26, Mich.

Concrete Mixers

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

Generators

80. Two portable generators, one for AC and the other for DC current are described in new bulletin issued by Homelite Corp., Port Chester, N. Y. Commonly used for operating electrical equipment in planes, tanks and trucks, or to charge batteries or to supplement batteries for starting main engines, etc.

Graders, Patrol

98. The Austin-Western 99M Power Grader with its powerful all wheel drive simplifies all construction and maintenance; handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow plowing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Co., Aurora, Ill.

Mixing Plants, Asphalt

106. The Cleaver Asphalt Mixing Plant for an inexpensive plant mix and the Cleaver Tank Car Heater and Bituminous Booster are covered in illustrated catalogs sent on request by Cleaver-Brooks Co., 3112 W. Center St., Milwaukee 9, Wis.

Mud-Jack Method

107. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee 10, Wis.

Pumps

115. Interesting new booklet tells how to lengthen the life of your pumps. Explains how a little care will save a lot of wear. Write today for your copy. Homelite Corp., 2403 Riverdale Ave., Port Chester, N. Y.

116. New illustrated catalog and prices of Jaeger Sure Prime Pumps 2" to 10" sizes, 7000 to 220,000 G.P.H. capacities, also Jetting, Caisson, Road Pumps, recently issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

117. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

118. 16 - page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee 12, Wis.

119. "Self-Priming Centrifugal Pumps," a 12 - page illustrated booklet showing details of construction of Carter Pumps. Ask for Bulletin 4310. Address: Ralph B. Carter Co., Hackensack, N. J.

120. "Humdinger" 2- to 8-inch self-priming portable pumps. A 23-page illustrated booklet giving full details. Address: Ralph B. Carter Co., Hackensack, N. J.

Road Building and Maintenance

126. Two and Four Wheel Scrapers, Bulldozers, Tamping Rollers, Winches, Hoists and Repair Towers are subject of special bulletins issued by Gar Wood Industries, 7924 Riopelle St., Detroit 11, Mich.

128. Two powerful Galion motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

129. Warco Hydraulic Control Motor Graders, Duplex Hydraulic Scoops and Whizzard, easily transported, rollers are described and illustrated in literature available from W. A. Riddell Corp., Bucyrus, Ohio.

130. BG Maintainer, a powerful, speedy, low-priced machine for light road maintenance. Write for folder, Huber Mfg. Co., Marion, Ohio.

131. Speed Scoop. A versatile small scraper unit, ideal for emergency repairs. Illustrated folder issued by Huber Mfg. Co., Marion, Ohio.

Rock Drill Maintenance

132. New booklet presents through amusing cartoons useful hints on proper rock drill maintenance methods — what your men can do to get more work out of your tools with a minimum of expense for repairs and compressed air. Write The Cleveland Rock Drill Co., 3734 East 78th St., Cleveland 5, Ohio.

Rollers

133. New Tu-Ton roller of simple construction for use in rolling sidewalks along highways, playgrounds and other types of light rolling is fully described in a bulletin issued by C. H. & E. Mfg. Co., 3841 No. Palmer St. Milwaukee 12, Wis.

138. "The Buffalo-Springfield" line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog issued by the Buffalo-Springfield Roller Co., Springfield, Ohio.

139. "Ironeroller" 3 Axle Roller for extra smooth surfaces on all bituminous work. Booklet contains roller data and operation details. The Hercules Roller Co., Bucyrus, Ohio.

140. This well - illustrated 16 - page catalog describes the tandem, autocrat, cadet, and roll-a-plane rollers, and explains what each is intended to accomplish. Write Austin-Western Co., Aurora, Ill.

141. Three - Wheel Rollers. Huber Automotive type rollers in 5 to 8 ton sizes and Huber 10 & 12 ton diesel rollers. New bulletins give full details and specifications. Huber Mfg. Co., Marion, Ohio.

142. Tandem Rollers. Variable weight tandem roller with three speeds forward and reverse for new highway surfacing and old road conditioning. Huber Mfg. Co., Marion, O.

Soil Stabilization

150. "High-Service, Low Cost Roads" is one of the newer booklets using an effective combination of picture and text to set forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated. 34 pages. Sent by Solvay Sales Corp., 40 Rector St., New York 6, N. Y.

152. The Columbia Chemical Division will be glad to furnish to anyone interested complete information dealing with Calcium Chloride Stabilized Roads. This literature contains many charts, tables and useful information and can be obtained by writing Columbia Chemical Div., Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh 19, Pa.

USE THIS COUPON

Readers' Service Dept., PUBLIC WORKS 12-44
310 East 45th St., NEW YORK 17, N. Y.

Please send me without obligation the following booklets listed in your READERS' SERVICE SECTION .....
(indicate by numbers)

Name .....

Occupation .....

Street .....

City ..... State .....

Spreader

187. Jaeger Paving equipment, including Mix-in Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.—4 complete catalogs of latest equipment in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

Surface Consolidation and Maintenance

188. Detailed and illustrated presentation of the method and procedure in consolidated operations; explains how sub-soils can be conditioned to resist softening and frost-action; how surfacing can be consolidated to provide smooth all-weather riding surfaces; how they can be maintained so as to prevent disintegration and gravel loss. Write the Calcium Chloride Association, Penobscot Bldg., Detroit 26, Mich., for Bulletin No. 29.

Transits and Levels

190. Transits, levels, and drafting room supplies: New catalog just issued, 56 pages giving full illustrated descriptions of surveying instruments and accessories. Address: Warren-Knight, 136 N. 12th St., Philadelphia 7, Pa.

Wellpoints

195. New complete catalog, "Griffin Pointed Wellpoint Facts," just issued. Covers pre-drainage, describing wellpoints, jetting pumps, with tables, diagrams and illustrations. Griffin Wellpoint Corp., 881 E. 141st St., New York 54, N. Y.

Street and Paving Maintenance

290. "Blacktop Road Maintenance and Construction Equipment" — Asphalt and tar kettles, flue type kettles, spray attachments with completely submerged pumps, tool heaters, surface heaters, road brooms, portable trail-o-rollers, etc. These are all described in detail and illustrated. This modern and up-to-date equipment for blacktop airport and road construction and maintenance is based upon experience and engineering research over a period of 42 years. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, Ohio.

Fire Apparatus

300. Detailed information and advice about specially engineered Ward LaFrance apparatus will be sent on request. Ward LaFrance Div., Elmira, N. Y.

Snow Fighting

Snow Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

351. A 4-page folder describes and illustrates Gettelman Hi-Speed Safety Snow Plows. Models for 1, 1½, 2, 3 ton trucks and up. Hoist frame demountable, reinforced to carry hydraulic hoist and plow. Vibratory blade cleans itself of ice and snow. Fred Gettelman Co., 4401 W. State St., Milwaukee 8, Wis.

Ice Control

352. Fast, self-feeding spreaders for ice control and seal coating that replace end gate on any dump truck, operated by driver of truck, are illustrated in new bulletin issued by Flink Co., 506 Vermillion St., Streator, Ill.

353. The new Flink sand spreader attachment that spreads sand faster from thinnest surfacing up to 2" layers and keeps a perfect edge is described in bulletin sent prompty by Flink Co., 506 Vermillion St., Streator, Ill.

354. Ice Prevention on Highways, Streets, and Airport Runways with Sterling "Auger Action" Rock Salt. An illustrated bulletin issued by International Salt Co., Inc., Scranton, Pa.

Sanitary Engineering

Aero-Filter

356. Aero-Filter Design Data is given in a new 32-page catalogue. It contains information on Advantages of Aero-Filter Process, Single Stage vs. Multi Stage Treatment, Filter Loadings, Rates of Flow and Results, Filter Depths, Recirculation, Sewage Pumps and Pump Control. Approximately 15 pages of blue prints are included in this instructive catalogue. Write Lakeside Engineering Co., 222 W. Adams St., Chicago 6, for a copy.

Air Release Valves

357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia 42, Pa.

358. Air Valves are the subject of Rensselaer Bulletin Q in which Air Release as well as Air and Vacuum, types are described. Address: Rensselaer Valve Co., Troy, N. Y.

Analysis of Water

360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York 6, N. Y.

Activation and Aeration

367. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20 pp. illustrated. Sent on request to Norton Company, Worcester 6, Mass.

Blowers

370. All interested in low cost air for sewage disposal will want a copy of this catalog describing operating principles and specifications of Roots-Connersville Aerating Blowers. Write to Roots-Connersville Blower Corp., 301 Valley Ave., Connersville, Ind.

Chlorinators, Portable

379. Complete data on new portable chlorinator designed to meet emergency calls quickly and efficiently. Write Wallace & Tiernan Co., Inc., Newark 1, N. J.

380. "Emergency Sterilization Equipment," a new bulletin describing the advantages of Dual Drive Chlor-O-Feeders which can serve as either a permanent chemical feeder or as a portable emergency chlorinator. Order from % Proportioneers, Inc. %, 96 Codding St., Providence 1, R. I.

Cleaning Water Mains

383. Water main cleaning by the National Method is title of 4-page folder describing methods and results obtained, with full data. National Water Main Cleaning Co., 30 Church St., New York 7, N. Y.

Cleaning Sewers With Own Forces

385. A 20-page booklet describes and illustrates a full line of sewer cleaning equipment—Rods, Root Cutters, Buckets, Nozzles and Flushers. Write W. H. Stewart (Pioneer Mfr. since 1901), Jacksonville, Fla., or P. O. Box 767, Syracuse, N. Y.

386. 32-page illustrated booklet explains how a city can clean its sewers and culverts with its own forces using the up-to-date Flexible Sewer Rod equipment. Illustrates and describes all necessary equipment. Issued by Flexible Sewer Rod Equipment Co., 9059 Venice Boulevard, Los Angeles 34, Calif.

387. Literature illustrating how cities, towns and villages using OK Champion Sewer Cleaners are doing a complete sewer cleaning job from street level. Three sizes of machines available in addition to full line of sewer rods and accessories. Issued by Champion Corporation, 4752 Sheffield Avenue, Hammond, Indiana.

388. Sewer Scooter, the only 100% self-propelling sewer cleaning machine, that removes sand, gravel, rocks, bricks, mud, grease, broken rods, metals, etc., from sewers is described in new illustrated bulletin. Write J. C. Fitzgerald, P. O. Box 289, Coral Gables, Fla.

Consulting Engineers

389. "Who, What, Why" outlines briefly the functions of the consulting chemist and chemical engineer. Covers various methods of cooperation, on different types of problems, with industry, with attorneys and with individuals. Foster D. Snell, Inc., 305 Washington St., Brooklyn, N. Y., will send a copy on request.

Feeders, Chlorine, Ammonia and Chemical

391. Feeders of all types including Hypochlorinators, Reagent Feeders, Dry Chemical Feeders, Chlorinators and Ammoniators are available in a wide range of capacities for feeding all of the usual chemicals used in sanitation practice—manufactured by Wallace & Tiernan Co., Newark 1, N. J.

392. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. %, 96 Codding St., Providence 1, R. I.

Filters, Vacuum

403. For bulletins on Vacuum Filters for dewatering primary, activated, digested or chemical sludge, write The Conkey Co., 420 Lexington Ave., New York 17, N. Y.

Fire Hydrants

405. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M & H Valve & Fittings Co., Anniston, Ala.

406. See listing No. 438.

407. Fire hydrants which are flood-proof, easy to operate and service are described in Rensselaer Bulletin W, formerly known as "Coreys." Address: Rensselaer Valve Co., Troy, N. Y.

408. For a concise description and illustrations of the Improved MUELLER-COLUMBIAN Fire Hydrants, complete parts list and full directions for ordering—get the new folder just issued by Mueller Co., Chattanooga 1, Tenn.

Flow Meters

409. The primary devices for flow measurement—the orifice, the pilot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (C42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia 42, Pa.

Gas Holders and Digesters

411. Digesters and Gas Holders for efficient collection and storage of sewage gas are described in an interesting illustrated booklet issued by Graver Tank & Mfg. Co., 332 South Michigan Ave., Chicago 4, Ill.

412. If your plans call for economical storage of digester gas, write for bulletin on Stacey Brothers All-Welded, High Pressure Spheres that combine safety with pleasing appearance. Stacey Brothers Gas Constr. Co., 5535 Vine St., Cincinnati 16, Ohio.

Gates, Valves, Hydrants

415. See listing No. 438.

416. Check valves of the Clear-Way, Quiet-Closing type which eliminate "Slam" are described in Rensselaer Bulletin Y. Made in expanding outlet type, as well as straight-thru type for bolting direct to pump discharge. Address: Rensselaer Valve Co., Troy, N. Y.

417. Rensselaer Gate Valves of high tensile strength, corrosion resistant iron are described in Rensselaer Bulletin X. Address Rensselaer Valve Co., Troy, N. Y.

418. A new four-page folder on MUELLER-COLUMBIAN Gate Valves gives construction details, shows various type of gear drive mechanism available, and has handy check list of dimensional data. Write Mueller Co., Chattanooga 1, Tenn.

419. Double-disc gate valves; hydraulically operated valves; air, check, flap and mud valves. Fire hydrants with sliding gate or balanced valve. A 32-page catalog. Ludlow Valve Mfg. Co., Inc., Troy, N. Y.

Gauges

421. The full line of Simplex gauges for filtration plants are illustrated and described in catalog issued by Simplex Valve and Meter Co., 6750 Upland St., Philadelphia 42, Pa.

Laboratory Equipment

423. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 80-page booklet. W. A. Taylor & Co., 7301 York Road, Baltimore 4, Md.

Manhole Covers and Inlets

429. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend 23, Ind.

Meters, Venturi

432. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corrosion, clogged pipes, etc. Write Builders-Providence, Inc., 9 Codding St., Providence 1, R. I.

433. "The Selection of Main Line Meters," a highly informative and useful presentation prepared by a competent engineer, J. C. Thoresen, describes forms of differential producers and quickly solves typical problems with the use of graphic charts. Write Builders-Providence, Inc., 9 Codding St., Providence 1, R. I.

Meters, Water

434. Pittsburgh IMO meters, claimed to be "the most accurate water meter ever commercially made," Arctic water meters for cold climates and Empire Streeemline water meters are illustrated and fully described in new bulletins issued by Pittsburgh Equitable Meter Co., 400 No. Lexington Ave., Pittsburgh 8, Pa.

435. "Watchdog" water meters, made in standard capacities from 20 GPM up; frost-proof or split case in household sizes. All parts interchangeable with present models of same manufacturer. For bulletins, write Worthington-Gamon Meter Co., 282-296 South St., Newark, N. J.

Pipe, Cast Iron

437. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

438. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., 400 Chestnut St., Philadelphia 5, Pa.

Pipe, Transite

442. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York 16, N. Y.

Pipe Joints, Water

443. Bellmaster Joints for simpler, faster, easier joining of cast iron pipe are illustrated in a new folder that gives full data on this self-contained mechanical joint. Write Dresser Mfg. Co., Bradford, Pa.

Pipe Joints, Sewer

444. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston, Adams, Mass.

Pipe Joint Compounds

446. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Pumps, Sludge

447. Carter Sludge Pumps are described in 8-page illustrated bulletin, including specifications and tables. Address: Ralph B. Carter Co., Hackensack, N. J.

448. Non-clogging, vertical or horizontal, dry pit or submerged; storm water and drainage pumps are described in several Bulletins; also sump and bilge pumps. Dayton-Dowd Co., Quincy, Ill.

Pumps and Well Water Systems

449. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis 8, Tenn.

450. Peerless pumps in a variety of types, with oil or water lubrication and any power drive, to pump water from any depth are described and illustrated in new literature that clearly shows their construction and special features. Write Peerless Pump Div., Food Machinery Corp., 301 W. Ave. at 26th St., Los Angeles 31, Calif.

451. Oil lubricated turbine pumps with open impellers. Five types of heads available. Specifications and illustrations in new bulletin 6930M-2 issued by Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill.

452. Centrifugal Pumps of various designs—single-stage, double-suction, split casing; single-stage single-suction; two-stage opposed impeller; three-stage; high-pressure; fire pumps; close-coupled. A bulletin for each type. Dayton-Dowd Co., Quincy, Ill.

Meter Setting and Testing

454. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

Screens

456. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa.

Sludge Drying and Incineration

458. "Disposal of Community Refuse by Incineration" is a handsome 34-page booklet that discusses incineration from a commonsense standpoint. Illustrated by numerous photos of typical installations and includes diagrammatic outlines of various plant designs. Write Morse Boulger Destructor Co., 207-P East 42nd St., New York 17, N. Y.

459. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

Softening

462. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago 4, Ill. Includes flow charts, tables and other valuable data. Write for a copy of this instructive folder.

Sprinkling Filters

466. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

Stand-by Motors

467. Buffalo stand-by motors for generators or pumping units are covered in illustrated specification sheets sent promptly by Buffalo Gasolene Motor Co., Dept. PW, Buffalo 3, N. Y.

Swimming Pools

468. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data, prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Taste and Odor Control

470. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York 17, N. Y.

471. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

Treatment

475. Three types of clarifiers for sewage treatment are illustrated and described in a new bulletin issued by Graver Tank & Mfg. Co., 332 South Michigan Ave., Chicago 4, Ill.

476. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

477. All-steel Rotary Distributors, correctly designed for the small and medium sized sewage plants, are the subject of a new, well illustrated booklet issued by Graver Tank & Mfg. Co., 332 South Michigan Ave., Chicago 4, Ill. This booklet also covers distributors for various types of high-rate trickling filters.

478. New booklet (No. 1642 on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa.

479. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

480. New illustrated folder (1942) on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 W. Hunting Park Ave., Philadephia 40, Pa.

483. A combination mechanical clarifier and mechanical digester. The Dorr Clarigester is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

484. Preflocculation without chemicals with the Dorrco Clariflocculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

485. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co., 570 Lexington Ave., New York 22, N. Y.

486. 28-page catalog describes and illustrates the Dorrco Hydro-Treator, a self-contained water treatment unit combining Flocculation, Sludge Thickening and Clarification. Reduces treatment time and lowers plant construction costs. The Dorr Co., 570 Lexington Ave., New York 22, N. Y.

488. "Packaged" Sewage Treatment Plants, specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2438 Wolfram St., Chicago 18, Ill.

489. "Carter Controlled Flocculation" is title of illustrated folder available on request from Ralph B. Carter Co., Hackensack, N. J.

Underdrains, Trickling Filter

492. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh 12, Pa., for free copy.

493. Full details about Armcre Filter Bottom Blocks for Trickling filter floors, includes drawings illustrating construction details. Complete bulletin available from The Bowerston Shale Co., Bowerston, Ohio.

Valves (See Gates, Air Release, etc.)

Water Treatment

494. New special folders contain the latest information on High Test Calcium Hypochlorite, Caustic Soda, Soda Ash, or Chloride of Lime as manufactured by Hood Chemical Co., 1819 Broadway, New York 23, N. Y. Write for desired folders, or use coupon in this section.

495. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago 4, Ill., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

496. "Use of copper sulphate in water treatment plants" titles informative booklet, with valuable data on chemicals, dosage, etc. Write Tennessee Corporation, Atlanta 1, Ga.

497. Ferri-floc Ferric Sulphate—a new, valuable booklet on coagulation for water and sewage treatment plants. Write Tennessee Corporation, Atlanta 1, Ga.

Water Service Devices

500. Data on anti-freze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati 2, Ohio.

30 or 150?

Does your locality enjoy 30 or 150 days of freezing weather?

It makes no difference to Murdock Outdoor Water Service Devices. They are anti-freezing—designed to operate as long as water mains are in operation.

Another reason why "It Pays to Install MURDOCK."

THE MURDOCK MFG. & SUP. CO.
426 Plum Street, Cincinnati 2, Ohio

MURDOCK SINCE 1851

SELF-CLOSING ANTI-FREEZING HYDRANT
"Air-Lock" ANTI-FREEZING OUTDOOR DRINKING FOUNTAIN
LARGE ANTI-FREEZING HYDRANTS 1¼" to 2" INCLUSIVE
LOCK-LID STREET WASHERS
ANTI-FREEZING COMPRESSION HYDRANT

Known Around the World as the Sign of Exellence in Water Treatment Equipment

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

The years of experience behind the Roberts nameplate is your assurance that any water rectification problem is expertly handled to your best advantage. As manufacturing and installation engineers, the Roberts organization is equipped to meet your exact needs regardless of the size of the equipment or the complexity of the problem.

Gravity Filters
*
Softening Plants and Equipment
*
Pressure Filters
*
Zeolite Softeners
*
Swimming Pool Recirculating Apparatus
*
Special Water Treatment Equipment

We invite your inquiries

ROBERTS FILTER MFG. CO.
Darby, Pennsylvania

(Continued from page 66)

the flow-dividing knife edge. A scale attached to the weir gives the liquid height above the weir lip so that total flow to the Rotaweir may be obtained.

The Micro-Rotaweir will handle flows from 30 G.P.H. to 900 G.P.H. Sizes up to 15,000 G.P.H. are also contemplated.

For complete information write to Fischer & Porter Company, 938 County Line Road, Hatboro, Pennsylvania

C. C. Moore

F. G. Swaffield

Pittsburgh Meter Combines Columbia and Atlanta Offices

Coincident with the retirement of F. G. Swaffield, District Manager of the firm's Columbia office, announcement of the change was made by A. J. Kerr, General Sales Manager.

Mr. Swaffield's retirement ends his 40-year career with the sales force of Pittsburgh Equitable-Merco Nordstrom. Joining the company in 1904 as a salesman and later appointed district manager of the Columbia office, he has been largely responsible for the wide current use of the company's products—Pittsburgh-National Water Meters, Emco Gas Meters and Regulators, and Nordstrom Valves—in the Columbia territory.

In assuming control of the Columbia office territory, C. C. Moore, manager of the Atlanta District office, now directs field sales in the entire southeast section of the United States. In this territory are the states of Florida, Georgia, Alabama, Mississippi, Tennessee, North and South Carolina, Virginia, and most of Kentucky.

Kuster Joins General American Process Equipment

O. R Kuster

O. R. Kuster has been named Chief Project Engineer of General American Process Equipment and is located at their New York office, 420 Lexington Avenue.

Mr. Kuster has had wide experience in chemical plant design in the Netherlands, Russia, Chile and this country, specializing in fertilizers, potash, aluminum and magnesium salts. He was formerly with the Dorr Company.

You can reach the whole CITY-COUNTY market effectively through this ONE magazine: PUBLIC WORKS

Advertising Index

Albright & Friel, Inc.	64
Alvord, Burdick & Howson	64
Atlas Mineral Products Co.	8
Baker, Jr., Michael	64
Black & Veatch	64
Bogert, Clinton L.	64
Bowerston Shale Co.	48
Briggs & Stratton Corp.	71
Buck, Seifert & Jost	64
Buffalo Gasolene Motor Co.	60
Buffalo-Springfield Roller Co.	59
Builders-Providence, Inc.	49
Caird, James M.	64
Carter Co., Ralph B.	56
Champion Corp.	46
C. H. & E. Manufacturing Co.	47
Chester Engineers	64
Cleaver-Brooks Co.	3
Cole & Son, Chas. W.	64
Dow, A. W., Inc.	64
Dresser Industries	36 & 37
Fairbanks, Morse & Co.	31
Ferguson, S. F.	64
Fitch Recuperator Co.	49
Fitzgerald, J. C.	58
Flexible Sewer Rod Equip. Co.	57
Ford Meter Box Co.	53
Frink, Mfr., Carl H.	44
Gannett, Fleming, Corddry & Carpenter, Inc.	64
General American Process Equip. Div.	4
General Chemical Co.	27
Gettelman Co., Fred	47
Goff, William A.	64
Goodwin Engrg. Co., J. W.	64
Gorman-Rupp Company	42
Greeley & Hansen	64
Green Co., Howard R.	64
Griffin Wellpoint Corp.	52
Hill & Hill	64
Huber Mfg. Co.	2
Industrial Chemical Sales Div.	35
Inst. Tr. Mun. Admin.	64
International Salt Co.	29
Jaeger Machine Co.	45
Johns-Manville Corp.	6
Koehring Co.	42
Layne & Bowler, Inc.	33
Le Roi Co.	62
Link-Belt Co.	55
Lozier & Co., Wm. S.	64
Meili-Blumberg Corp.	65
Metcalf & Eddy	65
Murdock Mfg. & Supply Co.	70
National Fireproofing Corp.	48
Pacific Flush Tank Co.	48
Peerless Pump Div.	63
Pirnie, Malcolm	65
Pittsburgh Equitable Meter Co	Front Cover
Proportioneers, Inc.	10
Radio Receptor Corp.	45
Rensselaer Valve Co.	53
Riddell Corp., W. A.	43
Robert & Co., Inc.	64
Roberts Filter Manufacturing Co.	70
Russell & Axon Cons. Engrs., Inc.	65
Simplex Valve & Meter Co.	51
Sirrine & Co., J. E.	65
Snell, Inc., Foster D.	65
Solvay Sales Corp.	71
South Bend Foundry Co.	46
Stacey Bros. Gas Constr. Co.	65
Stanley Engineering Co.	65
Stewart, W. H.	66
Unger, Samuel K.	65
U. S. Treasury Dept.	41
Wallace & Tiernan Co., Inc.	Back Cover
Ward LaFrance Truck Div.	9
Warren-Knight Co.	47
Weston, L. A.	46
Wood Co., R. D.	61
Worthington-Gamon Meter Co.	39

DECEMBER 1944

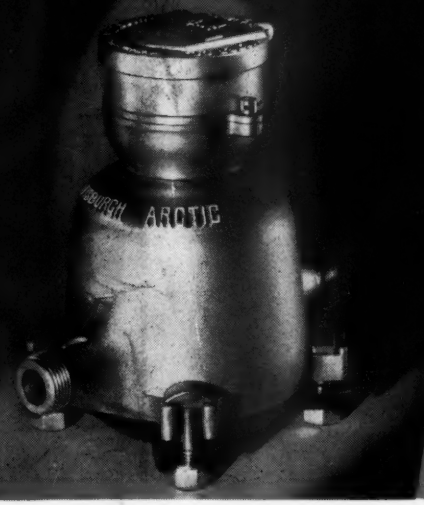
DEC 20 1944

Public Works

IN THIS ISSUE:

- Treatment of Icy Pavements
- Constructing Pasadena's Outfall Sewer
- Diatomaceous Earth Filters

An Old Favorite... IN NEW DRESS!



PITTSBURGH ARCTIC METERS
(Also made in Split-Case Tropic)

NEW, ATTRACTIVELY PROPORTIONED BRONZE CASE PROVIDES GREATER STRENGTH . . . . SMOOTH INTERIOR FLOW CONTOURS

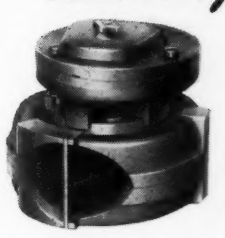
The Pittsburgh Arctic Water Meter, an old favorite among countless water works men who prefer a disc type meter, now emerges in a sleek, new streamlined bronze case. This redesigned case, aside from enhancing the appearance, also provides several practical engineering advantages. Its symmetrical shape makes possible a stronger casting having assured uniformity of wall thickness. With all recessed areas eliminated, smooth interior flow passages are provided that enhance the performance characteristics of the meter. There are no pockets where corrosion-inviting dirt or sediment can accumulate. This new bronze case is easier to clean and keep clean.

Water meter buyers have learned to expect superior meter designs, materials and construction methods from the PITTSBURGH-EMPIRE organization. The new Arctic helps keep the promise. Rigid manufacturing controls, skilled assembly and exacting test make these meters top dollar value in the disc meter field.

Blueprint Now!

PITTSBURGH EQUITABLE METER CO.
Atlanta Houston Brooklyn Pittsburgh Kansas City
MERCO NORDSTROM VALVE CO.
Main Offices, PITTSBURGH, PA.
Tulsa San Francisco
Los Angeles Boston Seattle Chicago New York
National Meter Division, Brooklyn, N. Y.

Working Parts Unchanged



Although outwardly changed in appearance, today's Pittsburgh Arctic Meter still employs the same time-tested inner working mechanism. Construction features include a reinforced disc formed from three individually molded parts; a two part snap joint measuring chamber, and an accurately cut oil enclosed gear train of three-wheel design. All working parts are assembled as a complete unit before being installed in the meter casing assuring accurate alignment.

PITTSBURGH-EMPIRE Water Meters

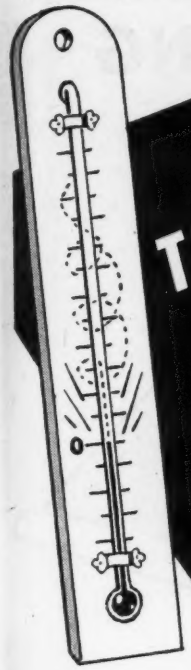
STILL BUSY...

Shortening the Road Home!

All the way from wind-swept northern wastes to the sunnier clime pictured here, Huber Road Rollers are busy on the construction projects which accompany each thrust of our armed forces toward their next objective. But it won't be long, we trust, until these new Hubers . . . which are well worth waiting for . . . will be ready to help you speed this country's post-war highway improvement program.

THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.

HUBER ROLLERS



TUMBLING THERMOMETER TIME IS HERE!

A partial check-list of Cleaver-Brooks equipment for cold weather construction and maintenance!

DESPITE cold and wet weather, construction and maintenance work must go on.

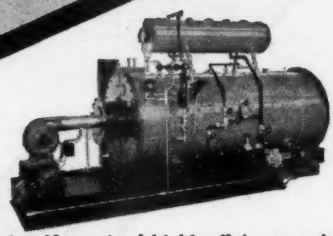
Cleaver-Brooks equipment provides steam, heat or hot water — fast, efficiently and at low cost — for a wide range of cold weather needs, such as—

- heating asphalt, road oils, bituminous materials in tank cars and storage tanks.
- heating water for central mixing plants.
- thawing and heating aggregate in stock piles or bins — for winter concreting.
- steam for cleaning machinery, thawing frozen ground, operating steam hammers, heating buildings and offices, and other uses.

Write for bulletins and complete information on the entire line of Cleaver-Brooks equipment for cold weather construction and maintenance.

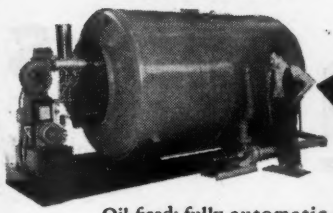
CLEAVER - BROOKS COMPANY
5120 North 33rd Street • Milwaukee 9, Wisconsin

AUTOMATIC STEAM PLANTS



Completely self contained; highly efficient; require only simple piping connections to place in operation. Fully automatic fuel-oil burner; condensate recovery and feed water pumping system; no stack needed, sizes ranging from 20 to 500 h. p.; pressures 15 to 200 lbs.

HOT WATER BOOSTERS

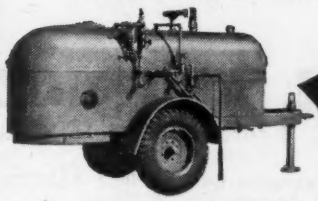


Oil-fired; fully automatic or manual operation; no licensed engineer needed to operate; two capacity sizes: 3000 gals. storage tank providing 1600 gals. of water heated 150° F. per hour; 1500 gals. storage tank providing 800 gals. of water heated 150° F. per hour.

PORTABLE PUMPING BOOSTERS

Heats bituminous material by direct firing in one operation, loading directly to distributor, relay truck or returning to tank car. Built in two sizes, truck mounting or 4-wheel trailer.

PORTABLE TANK-CAR HEATERS



Available in 2 and 3 tank-car sizes. Oil-fired with exclusive four-pass flue travel; dry-coil steam condensate return under pressure — no water or heat loss. An all-purpose unit — provides a portable source of steam wherever needed.

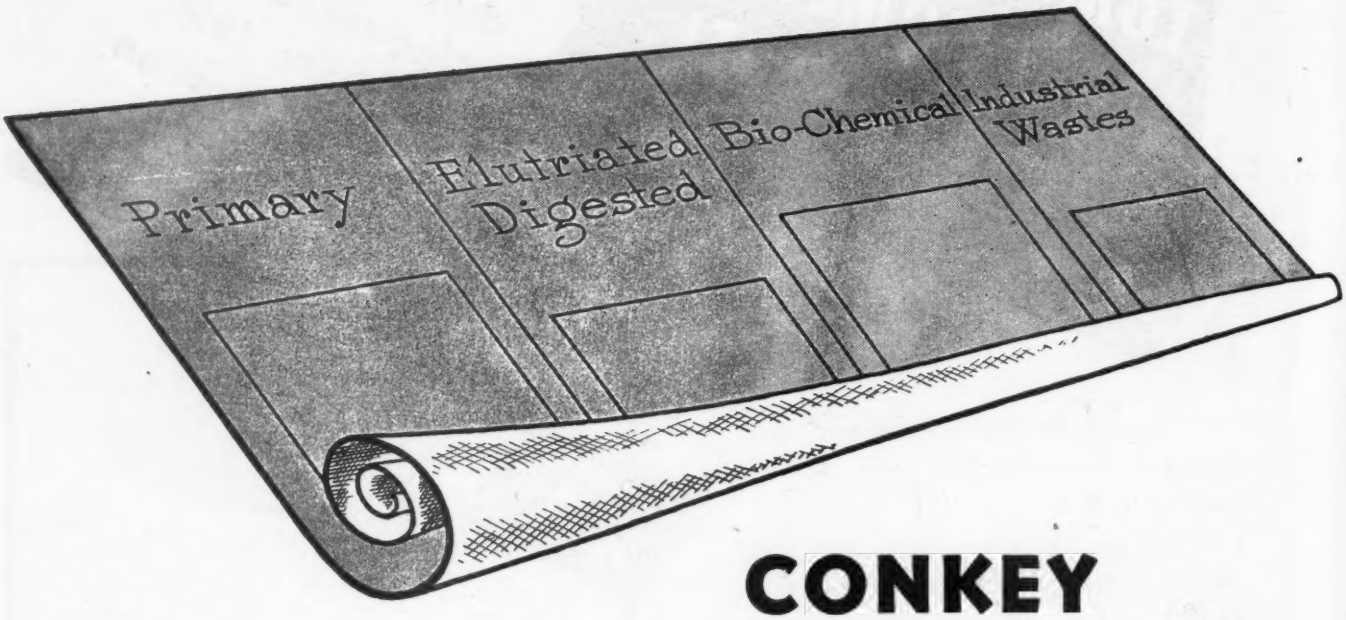
Cleaver-Brooks

PIONEERS AND ORIGINATORS OF

TANK CAR HEATERS . . . BITUMINOUS BOOSTERS . . . AUTOMATIC STEAM PLANTS

VOL. 75 PUBLIC WORKS No. 12
Entered as second-class matter at the Post Office at New York, N. Y., Sept. 1, 1929, under the act of March 3, 1879.
Published monthly by PUBLIC WORKS JOURNAL CORPORATION, 310 East 45th St., New York 17, N. Y.
Subscription Rates: U. S. A. and Possessions, Mexico and Cuba, $3.00; Canada, $3.50. All other countries, $4.00.
DECEMBER, 1944

PLANS for BETTER DEWATERING of SLUDGES Should Include



CONKEY SLUDGE FILTERS

GENERAL AMERICAN PROCESS EQUIPMENT DIVISION GATX GENERAL AMERICA

General American Process Equipment is a consolidation of four outstanding process equipment manufacturers, each a well-known specialist in its field, now welded together to serve you with one organization, one responsibility and one high standard of performance.

This organization also represents the Plate and Welding Division of General American Transportation Corp., at Sharon, Pa.

Conkey engineers can be helpful—NOW—to municipal and consulting engineers in preparing plans for badly needed sewage and waste disposal plants.

The ability of Conkey Sludge Filters to efficiently dewater the various types of sludges and wastes—regardless of the size of the community—has been proved for many years.

Operating records of overloaded and overworked sewage disposal plants in this country will disclose the superior performance of these filters during the past few years under adverse conditions. For better and more efficient plants for the future, get in touch with a Conkey engineer.

GENERAL AMERICAN PROCESS EQUIPMENT

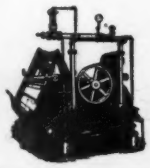
A Division of General American Transportation Corporation

Executive Offices: 443 BAXTER AVENUE, LOUISVILLE 4, KENTUCKY
New York Office: 420 LEXINGTON AVENUE, NEW YORK 17

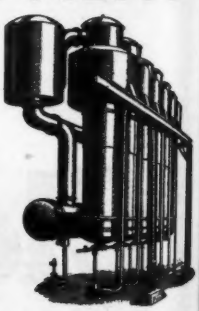
FRACTIONATING COLUMNS, PRESSURE VESSELS

TURBO-MIXERS, AGITATORS, AERATORS

CONKEY VACUUM AND PRESSURE FILTERS


AMERICAN DRUM DRYERS AND FLAKERS

LOUISVILLE DRYERS, COOLERS, KILNS


CONKEY VACUUM EVAPORATORS

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 67-69*

WARD LaFRANCE TRUCK DIVISION

GREAT AMERICAN INDUSTRIES, INC.

ELMIRA NEW YORK

MEMORANDUM TO THE ADVERTISING AGENCY

FROM: A. Ward LaFrance, Vice President
Great American Industries, Inc.

SUBJECT: WARD LA FRANCE TRUCKS FOR FLEET OWNERS

As you know, there are some interesting, perhaps revolutionary, ideas under development here at our Elmira plant, and I know you can't wait to tell prospective users about them. That is understandable. But please keep this clearly in mind:

> Motor truck fleet owners are practical people. They are badly in need of replacement vehicles, and they are interested in the proved ideas which can be incorporated in trucks We have some fundamentally important things to tell these gentlemen, so let's not waste paper on gaudy promises and fanciful pictures of beautiful, streamlined dreams of postwar models.

Let's try to get the fact across that Ward LaFrance trucks have a twenty-five year reputation for being good trucks. Let's admit frankly that Army Ordnance engineers have increased our know-how and made it possible for us to build still better ones after the last M-1 Heavy Wrecker has been delivered.

Fleet owners should be particularly interested in our new policy of concentration on their needs. This is of great importance because it will enable us to engineer and build vehicles to their exact needs. Fleet owners will recognize that this policy will result in a truck which will out-perform and outlive standard production models in a great majority of cases. Chances are, however, people will assume such trucks will cost too much. If you people in the agency can persuade fleet owners to get the facts from our engineering staff, that is all we ask of you. We can demonstrate clearly the fundamental economy of the new Ward LaFrance policy to any fleet owner's satisfaction.

A. Ward LaFrance.

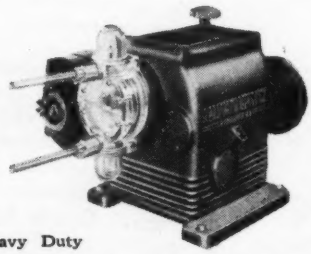
GREAT AMERICAN INDUSTRIES, INC., GENERAL OFFICES, MERIDEN, CONNECTICUT
DIVISIONS
CONNECTICUT TELEPHONE & ELECTRIC DIVISION, MERIDEN, CONNECTICUT
WARD LaFRANCE TRUCK DIVISION, ELMIRA, N. Y.—FACTORY BRANCH, 139TH ST. & EASTERN BLVD., NEW YORK
VIRGINIA RUBATEX DIVISION, BEDFORD, VIRGINIA
RUTLAND ELECTRIC PRODUCTS DIVISION, RUTLAND, VERMONT

WHEN IT COMES TO — *Chemical Feeding*

No baby formula was ever mixed with the exactness (100%±1½%) that thousands of %Proportioneers% Chem-O-Feeders are regularly feeding alum, soda ash, hypochlorite and other chemicals for municipal and private water supplies.

It is easy to be precise with the Heavy Duty Chem-O-Feeder, youngest member of %Proportioneers% family. By simply turning the feed selection knob you can adjust the feeding rate while the pump is in operation. With the transparent "See-Thru" plastic head, you can observe the movement of the valves and the steady flow of the liquid.

For information on accurate chemical feeding write for Bulletin SAN 2.



%Proportioneers% Heavy Duty Chem-O-Feeder for all chemical feeding up to 7 g.p.h. and 100 p.s.i.g.

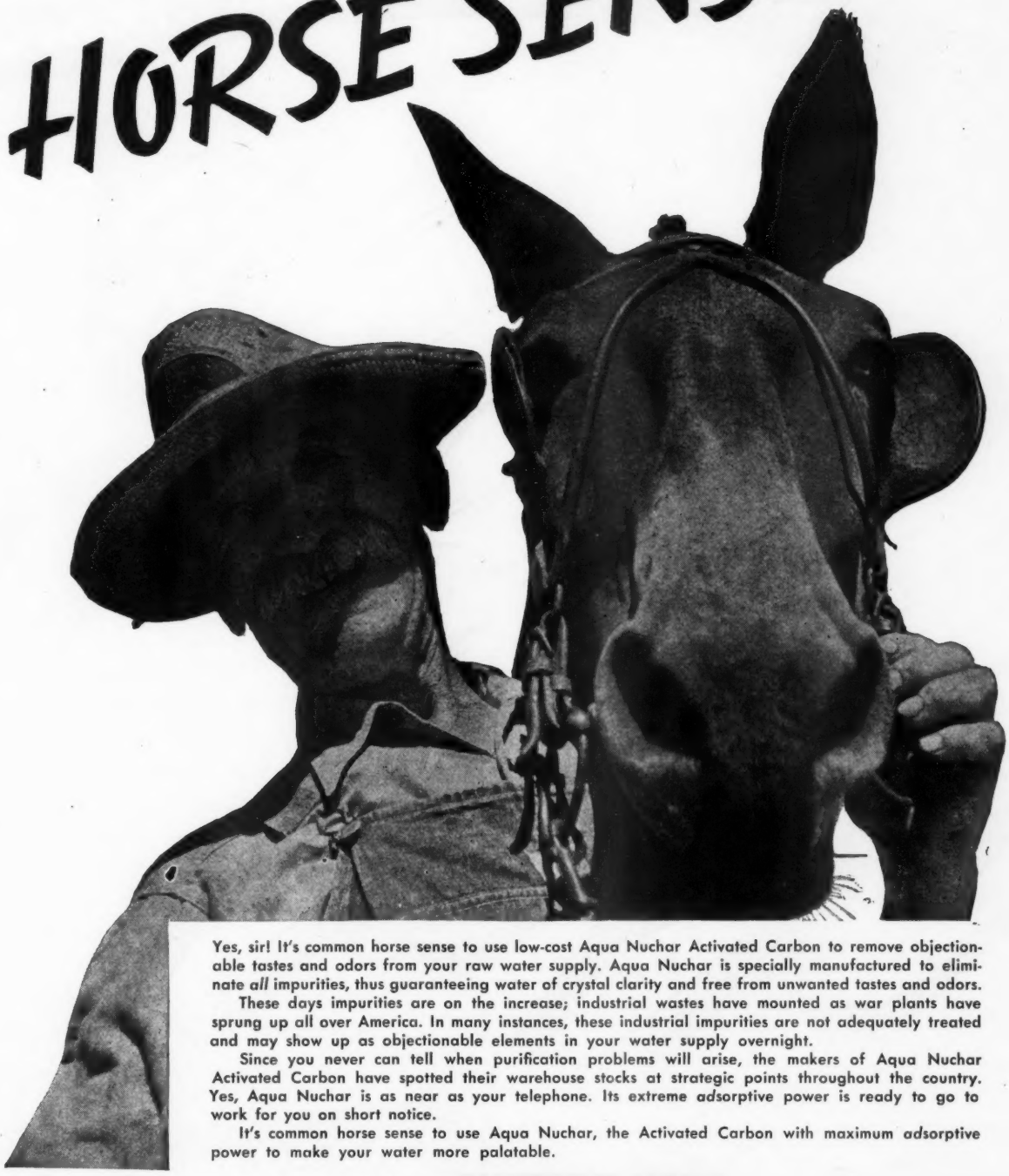
%PROPORTIONEERS, INC.%

Chemical Feeder Headquarters

96 CODDING ST., PROVIDENCE, R. I.

When you need special information—consult the classified **READER'S SERVICE DEPT.**, *pages 67-69*

HORSE SENSE!



Yes, sir! It's common horse sense to use low-cost Aqua Nuchar Activated Carbon to remove objectionable tastes and odors from your raw water supply. Aqua Nuchar is specially manufactured to eliminate *all* impurities, thus guaranteeing water of crystal clarity and free from unwanted tastes and odors.

These days impurities are on the increase; industrial wastes have mounted as war plants have sprung up all over America. In many instances, these industrial impurities are not adequately treated and may show up as objectionable elements in your water supply overnight.

Since you never can tell when purification problems will arise, the makers of Aqua Nuchar Activated Carbon have spotted their warehouse stocks at strategic points throughout the country. Yes, Aqua Nuchar is as near as your telephone. Its extreme *adsorptive* power is ready to go to work for you on short notice.

It's common horse sense to use Aqua Nuchar, the Activated Carbon with maximum *adsorptive* power to make your water more palatable.

BLUEPRINT NOW!

But above all, remember there is a war yet to be won. Maintain equipment to assure operation at 100% efficiency.

NUCHAR — INSURES PALATABLE DRINKING WATER

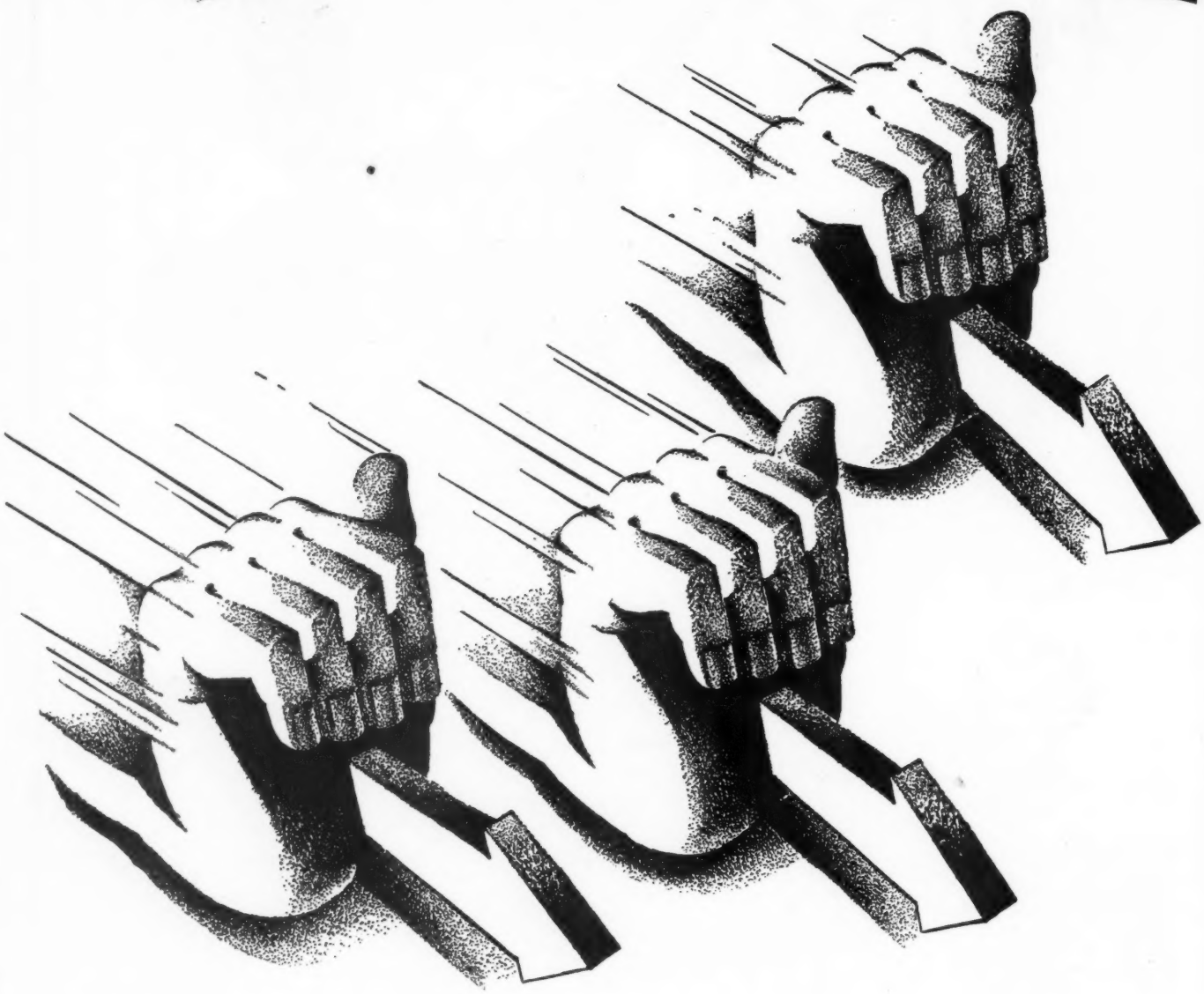
INDUSTRIAL CHEMICAL SALES

DIVISION WEST VIRGINIA PULP & PAPER COMPANY

230 PARK AVENUE, NEW YORK 17, N.Y. — 35 E. WACKER DRIVE, CHICAGO 1, ILLINOIS — 748 PUBLIC LEDGER BLDG., PHILADELPHIA 6, PA. — 844 LEADER BLDG., CLEVELAND 14, OHIO

When writing, we will appreciate your mentioning **PUBLIC WORKS**

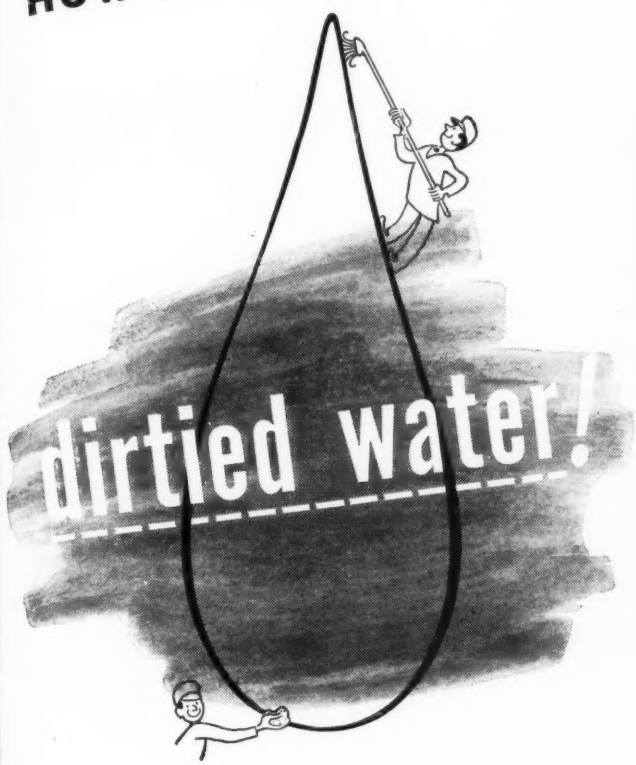
THREE NEW PARTNERS . . . GOING



TERMINAL TOWER
CLEVELAND, OHIO

When you need special information—consult the classified **READER'S SERVICE DEPT.**, *pages 67-69*

How to "WASH"



dirtied water!

Contaminated water streams are deadly carriers of disease-spreading bacteria . . . *dirtied waters* that endanger the health of soldiers on fighting fronts . . . the safety of war-torn civilian communities . . . and imperil the water supply and sewage disposal systems of industrial areas.

SOLVAY Liquid Chlorine effectively "*washes out*" bacteria, algae, foul tastes, and odors from dirtied water. Army engineers and municipal health authorities rely on this chlorine bactericide to make water *safe*.

Today, SOLVAY Liquid Chlorine safeguards the water supply of a nation and its fighters . . . tomorrow, it will serve municipalities and industry with newly discovered benefits.

SOLVAY
TRADE MARK REG. U. S. PAT. OFF.
LIQUID CHLORINE

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

40 RECTOR STREET NEW YORK 6, N. Y.

BRANCH SALES OFFICES:

Boston	Cincinnati	New Orleans	Pittsburgh
Charlotte	Cleveland	New York	St. Louis
Chicago	Detroit	Philadelphia	Syracuse

Guiding Fingers of Light

From newly established positions, portable beacon units guide and warn supporting ships and aircraft. Their electric generating plants are powered by rugged, quick-starting Briggs & Stratton engines —another one of many vital war services by hundreds of thousands of Briggs & Stratton engines.

Air-Cooled Power

4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

Briggs & Stratton leadership in design, engineering and precision manufacture is backed by the performance record of more than TWO MILLION Briggs & Stratton engines—and a quarter-century of *continuous* production of "*air-cooled power.*" You can profit by this experience in your plans for the future —whether you manufacture, sell or use power equipment. BRIGGS & STRATTON CORP., Milwaukee 1, Wis., U.S.A.

Will these new facts about FREE CHLORINE RESIDUALS make "Presumptives" rare as "Positives"?

Positive confirmation of coliform bacteria is now a rarity at plants where chlorination is continuously used. The persistence of gasformers, however, has been the bane of sanitary engineers to whom a bacteria-free water is the ultimate ideal.

Their "passion for perfection" has brought new facts to light. These facts establish that *free available chlorine residuals* — and only such residuals — can assure the destruction of all gasformers. (1) (2). They also indicate test procedures that distinguish between free available chlorine residuals and those in which chloramines are a factor. (3) (4) (Details of the preferred procedure in your area can be supplied.)

Application of Break-point chlorination in the light of these new findings is now serving to make "presumptives" as rare as "positives". Yet problems of overchlorination are avoided, and reductions in the taste and odor of the finished water are frequently secured.

In fulfilling your post-war responsibility for a safer, more palatable water, these facts will be of decided interest. Your Wallace & Tiernan Representative can furnish them.

1. Cox — Jl. A.W.W.A., 31:1489. (1939)
2. Streeter — Jl. A.W.W.A., 35:421. (1943)
3. Laux, Nickel — Jl. A.W.W.A., 34:1785. (1942)
4. Hallinan — Jl. A.W.W.A., 36:396. (1944)

ARMY E NAVY

WALLACE & TIERNAN COMPANY, INC.

Manufacturers of Chlorine and Ammonia Control Apparatus
Newark 1, New Jersey • Represented in Principal Cities

SA-177